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Differing Site Conditions Module for the Claims Guidance System: Initial Development of an Expert System

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The Claims Guidance System is an expert system that (1) provides Corps of Engineers field engineers with prelegal assistance in reviewing potential construction contract claims and (2) serves as a training tool for inexperienced engineers, familiarizing them with the legal reasoning process. Differing site condition claims were selected as the first type of claim to be represented by a module in the Claims Guidance System.

To use the Claims Guidance System, the project engineer provides relevant information regarding a particular differing site condition claim that he wishes to evaluate. The system analyzes this information and provides recommendations based on legal precedence. By using this system the new project engineer will develop a sense of what information should be documented and reviewed before consulting a lawyer. The Claims Guidance System will help Corps of Engineers project engineers document necessary information and make appropriate decisions so that lengthy claims and litigations can be avoided, saving time and money.

The system is being developed on microcomputers using Personal Consultant Plus, an expert system shell developed by Texas Instruments, Inc. The first module is ready for initial field testing. Site selection is underway.

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To use the Claims Guidance System, the project engineer provides relevant information regarding a particular differing site condition claim that he wishes to evaluate. The system analyzes this information and provides recommendations based on legal precedence. By using this system the new project engineer will develop a sense of what information should be documented and reviewed before consulting a lawyer. The Claims

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FOREWORD

This work was conducted for the Directorate of Engineering and Construction, Headquarters, U.S. Army Corps of Engineers (HQUSACE), under Project No. A62731AT41, Task B, "Construction Management Technology"; Work Unit 045, "Claims Guidance System." The Technical Monitor was Mr. Mahlon Patterson (CEEC-CM).

The work was performed by the Facility Systems Division of the U.S. Army Construction Engineering Research Laboratory (USA-CERL). Mr. E. A. Lotz is Chief of USA-CERL-FS. The authors wish to thank Dr. M. J. O'Connor, Mr. Tim Kruppenbacher, and Mr. Bill East who made significant contributions to the development of the CGS. The authors also would like to thank the members of the CGS-DSC steering committee: John Bauman, Baltimore District (CENAB-S); Frank Carr, Office of the Chief Counsel, HQUSACE (CECC-F); Bernie Klover, Missouri River Division; John Mahon, also of the Office of the Chief Counsel (CECC-C); Mahlon Patterson, Directorate of Engineering and Construction (CEEC-CM); and Ronald Wing, Tulsa District (CESWT-A). The technical editor was Jane Andrew, Information Management Office (CECER-IMT).

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DIFFERING SITE CONDITIONS MODULE FOR THE CLAIMS GUIDANCE SYSTEM: INITIAL DEVELOPMENT OF AN EXPERT SYSTEM

1 INTRODUCTION

Background

In recent years, research in the field of artificial intelligence has had many important successes. Among the most significant of these has been the development of powerful new computer systems known as expert systems. These programs are designed to represent and apply factual knowledge of specific areas of expertise to problems with the problem-solving capabilities of recognized human experts. For example, collaborative efforts by human experts and system developers have resulted in systems which diagnose diseases, configure computer systems, diagnose welding defects, and provide legal advice. Because these systems enhance accuracy, problem-solving capabilities, and overall job performance of a wide range of personnel, they can save both time and money. The potential power of systems which can replicate human knowledge has led to a worldwide effort to extend and apply this technology.

Only recently, expert systems have become available with a variety of practical applications for microcomputers, due to the exploding interests of the computer software industry in providing expert system programming tools called shells. Today's expert system technology makes it possible to address a significant problem facing the construction industry: the need for legal claims expertise at the field level. Construction in the 1980's has become a very complicated industry, with many intertwined relationships and intense competition. For contractors, this has meant that bid margins are low and claims have multiplied in size and number. For owners, this has meant more disputes and greater exposure to large claims. There seems to be a great potential for the application of state-of-the-art knowledge in expert system technology to the practical areas of construction. An expert system could help minimize some of these problems by providing field personnel some guidance on handling various types of potential claims.

Many claims involve unknown subsurface or latent physical conditions at the work site, which represent a very significant risk inherent in many construction contracts. The "Differing Site Condition (DSC)" contract clause represents an effort by the U.S. Government to reduce the risk to the construction contractors of such unknown or unanticipated conditions. The purpose of this clause is to allow contractors to submit their bids based on reasonably foreseeable conditions, without contingencies to cover the unexpected or unusual. In return, the bidder is provided assurance that if conditions prove different than anticipated, an equitable adjustment will be made in the contract price and/ or time. Without this clause, the contractors, in order to meet the requirement for submitting a fixed price, had no alternative but to include contingency allowances in their bids to cover the cost of coping with possible subsurface difficulties, which in fact may not have occurred during subsequent performance of the contract. This caused the Government to pay more than the actual work was reasonably worth.

Studies by Mogren[1] and Diekmann and Nelson[2] have shown that differing site condition (DSC) claims are relatively frequent and costly reasons for Government construction contract changes. U.S. Army Corps of Engineers (USACE) field engineers who are faced with such claims need to understand the legal issues involved so they can supply the appropriate information to legal counsel and avoid lengthy litigations caused by incorrect decisions. Personnel who are unfamiliar with this process must rely on experienced engineers for help in analyzing a claim. Automating the analysis of potential claims through an expert system could help Government employees handle DSC claims more efficiently and consistently.

Specifically, an expert system for analyzing potential claims insures that a rigorous evaluation is performed consistently. It provides a written document of the claim analysis for future reference, which is especially useful if the claim must be defended. In addition, repeated use of the expert system sharpens the field engineers' claims evaluation skills which will help them identify potential claims sooner, avoid conflicts if possible, and support their position with adequate documentation.

Objective

This report has two objectives: (1) to describe the development of the first module (Differing Site Condition [DSC]) of an expert system for evaluating construction contract claims (Claims Guidance System [CGS]), and (2) to provide preliminary instructions for users of this module.

Approach

CGS-DSC is based on the work of Diekmann and Kruppenbacher.[3] Using the expert system technology, they developed a prototype of a system, on a mainframe computer, that performs analysis of differing site conditions claims. Their system is based on the expertise incorporated in the related decisions of the Board of Contract Appeals and on the knowledge of an experienced lawyer. CGS-DSC includes revisions and enhancements of their work which are the results of discussions with experienced project engineers from USACE field offices and recommendations from the CGS steering committee. For this committee, Mr. Mahlon Patterson of the Construction Management Branch, Construction Division HQUSACE recommended six experts with many years of experience in dealing with construction claims. CGS-DSC is implemented on the IBM-XT or -AT compatible microcomputers which are readily available at field offices.

Early in the development of the module, it was decided that CGS-DSC should have three purposes: (1) to provide an inexperienced project engineer with prelegal assistance in the analysis of differing site condition claims, (2) to provide a tool for documenting all necessary information for potential claims, and (3) to serve as a training device to familiarize new field office personnel with the legal reasoning process.

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[1] E. T. Mogren, "The Causes and Costs of Modification to Military Construction," Masters Thesis, U.S. Army General Command and General Staff College, May 1986.

[2] J. E. Diekmann and M. C. Nelson, "Construction Claims: Frequencies and Severity," *Journal of Construction Engineering and Management*, Vol 111, No. 1 (American Society of Civil Engineers [ASCE], 1985), pp 74-81.

[3] J. E. Diekman and T. A. Kruppenbacher, "Claims Analysis and Computer Reasoning," *Journal of Construction Engineering and Management*, Vol 111, No. 1 (ASCE, 1984), pp 391-408.

The system's knowledge was programmed using the Personal Consultant Plus* environment. It allows the knowledge to be represented by rules. Incomplete or uncertain information is handled by entities called certainty factors, which quantify the confidence associated with an assumption.

CGS-DSC begins evaluating a claim by prompting the user with a set of questions that indicate what information is required to reach a complete analysis. The questions asked depend in part on the user's answers to previous questions. At the same time, the user is shown an appropriate flow of milestones for the analysis, helping him/her shape a clearer mental image of the legal reasoning process. The system will use its internal rules to reach a tentative conclusion for the case, based on the experts' knowledge which is available to it. CGS-DSC can also display an actual case similar to the situation described by the user, by searching the case database included in the system. A dBASE III Plus* interface with Personal Consultant Plus was necessary to enable this search.

The system development is currently at the operational prototype stage. Enough work has been completed to yield a system that performs a reasonable analysis of a claim. However, extensive work is still required to update and enhance the legal knowledge embedded in the system. This work will be performed mainly by incorporating inputs from the CGS steering committee, which has reviewed the system and suggested enhancements to make it more useful and acceptable to field office users. The committee furnished input at a workshop on 25 and 26 March 1987 and in response to a questionaire survey.

The system was ready for field testing in the fourth quarter of FY87, and the field test site is being selected.

Scope

This report covers only the Differing Site Condition clause. However, after the field testing of CGS-DSC, additional modules will be developed covering other types of potential claims, such as Suspension of Work clause, Changes clause, etc. The CGS steering committee will select the next modules.

Mode of Technology Transfer

The Claims Guidance System will be field tested, distributed, and demonstrated at appropriate offices where DSC claims are handled. This system will be on two floppy disks and will be accompanied by a user's manual.

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*Personal Consultant Plus is a trademark of Texas Instruments.
*dBASE III Plus is a trademark of Ashton-Tate.

2 DEVELOPMENT OF CLAIMS GUIDANCE SYSTEM

CGS was created using the development process common to all expert systems, which consists of:

- Deciding what the system should do
- Selecting an expert system shell
- Selecting a particular application (differing site condition claims, in this case)
- Acquiring expert knowledge
- Validating and enhancing the system.

Deciding What the System Should Do

The original objective of the system was to provide assistance to field engineers in analyzing and evaluating potential claims. However, as the development progressed, another objective became as important as the original one, namely, to provide a tool for documenting all relevant information in the claims analysis for future reference. Therefore, the expert system not only analyzes potential claims but also collects all necessary information and provides a record of the collected information. It also became clear this system will be a very useful training tool for new personnel in the field offices.

In order to reach these objectives--a tool for evaluating potential claims, for collecting relevant information and for training new personnel, the system should be easy to use, user-friendly, interactive, and usable with IBM compatible microcomputers readily available at the Corps field offices. By their nature, expert systems are large consumers of computer power, and they function more efficiently using specialized hardware (i.e., LISP [list processing] machines). Specialized hardware offers the added advantage of providing user-friendly software environments that are particularly productive in the context of rapid prototyping of expert system functions. However, since the delivery environment for CGS is the Corps field offices, only expert system shells that run on IBM compatible microcomputers were considered.

Selecting an Expert System Shell

There is a significant number of commercial expert system development shells to choose from. Richer[4] has presented a set of criteria for evaluating these tools. These criteria include an evaluation of basic features, the development environment, how easy it is to learn and use, efficiency of the development and run-time environment, how much it costs, and how well it is supported.

[4] M. H. Richer, "An Evaluation of Expert System Development Tool," *Expert Systems—The International Journal of Knowledge Engineering* (Learned Information, Oxford), Vol 3, No. 3 (July 1986), pp 166-183.

Considering these criteria, the Personal Consultant Plus by Texas Instruments was selected. Since most of the Corps field offices where the CGS will be used are equipped with IBM compatible microcomputers, it was necessary to select a shell that will run on these computers.

When the CGS project started (Fall 1985), the best shell available appeared to be the Personal Consultant. It provided a user-friendly interface, an acceptable knowledge-base editor, why/how capabilities, and acceptable speed of execution. Also it was easy to use and reasonably priced ($2995). Later, in Spring 1986, Texas Instruments enhanced the program to form "Personal Consultant Plus," providing capabilities to use more than 640K (640 kilobytes) of memory for developing the knowledge-base and to access other programs/files, along with a graphics interface and a better editor. Developing the knowledge base required more than 640K memory, but 640K is adequate for running a consultation session.

The Personal Consultant Plus Runtime system must be purchased for distribution to field offices in addition to the Claims Knowledge Base diskette. The price for one runtime disk is about $50 when 20 copies are bought at once. This is a very reasonable price compared with other available shells, considering that hundreds of copies will be needed for distributing CGS to field offices.

Selecting Differing Site Condition Claims

The first module for CGS deals with differing site condition (DSC) claims. Of all the types of construction claims, the DSC clause was selected for the following reasons:

1. It is a concise and well written clause, making it less open to differing interpretations than other types of claims.

2. It is a very independent clause, rarely referenced by or linked to other clauses. Thus it can be treated as a self-contained legal concept, reducing the complexity of the analysis.

3. DSC litigation is intended to show that a contractual right to recover exists, whereas the litigation resulting from many other construction claims is intended to show that some form of breach of contract has occurred. Since it is easier to prove the existence of a contractual right than to prove the occurrence of a breach of contract, the analysis of DSC claims is less complex than that of many other construction claims.

4. Studies have shown that DSC claims are among the most frequent and costly reasons for construction contract changes.[5]

5. Diekmann and Kruppenbacher have demonstrated that there is significant potential for applying artificial intelligence to claims analysis. They identified the need for more developmental work in this area to make this technology a viable tool for construction professionals in claims analysis. Following their suggestion to use DSC and taking advantage of their work on knowledge acquisition, the DSC clause was selected for an expert system that will be used in the real-time environment at the Corps field offices.

[5]E. T. Mogren; J. E. Diekmann and M. C. Nelson.

Acquiring Expert Knowledge

The knowledge acquisition process for the CGS-DSC was based on the work of Diekmann and Kruppenbacher. They developed a prototype system that performs analysis of differing site conditions claims on a mainframe computer. Their system is based on the expertise incorporated in decisions by the Board of Contract Appeals and on the expert knowledge obtained from discussions with an experienced lawyer.

The logic diagram of Kruppenbacher's[6] study was reviewed by an experienced Corps field engineer and was revised and simplified to fit the Corps office environment. The questions used in Kruppenbacher's system include many legal terms that could confuse the field engineers; therefore, questions for CGS-DSC were changed to be easily understandable by the Corps field office personnel. Using the revised logic diagram and questions, rules were developed to create the test version of CGS-DSC.

A steering committee was formed to review the test version and to evaluate it for validity and completeness. The committee consisted of six experts: two experienced legal counsels from HQUSACE and four engineers with many years of experience in construction contract management within the Corps. The committee suggested many enhancements and necessary corrections to the logic diagram. The revised logic diagram is shown in Appendix A.

In revising rules for the second test version, fictitious cases were generated for the committee members to review. They evaluated these fictitious cases and rated the contractor's chance of entitlement based on the following scale: (1) very poor chance, (2) poor chance, (3) difficult to decide, (4) fair chance, (5) good chance, and (6) excellent chance. For each case, a case summary described the relevant facts as shown in the introduction to the sample consultation session in Chapter 7. After committee members considered one case, they were given about 25 to 30 "what-if" questions describing minor variations in the case and were asked to provide their opinions on the effect, if any. They performed these ratings for every case. Responses were collected to enable the CGS-DSC to handle as many cases as possible.

The Differing Site Conditions Clause (Federal Acquisition Regulation [FAR] 52.236-2) used by the U.S. Government in its contracts cites:

> (a) The Contractor shall promptly, and before the conditions are disturbed, give a written notice to the Contracting Officer of (1) subsurface or latent physical conditions at the site which differ materially from those indicated in the contract or (2) unknown physical conditions at the site, of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the contract.
>
> (b) The Contracting Officer shall investigate the site conditions promptly after receiving the notice. If the conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performing any part of the work under this contract, whether or not changed as a result of the conditions, an equitable adjustment shall be made under this clause and the contract modified in writing accordingly.

[6]T. A. Kruppenbacher, *The Application of Artificial Intelligence to Contract Management*, USA-CERL Technical Manuscript P-166/ADA146681 (U.S. Army Construction Engineering Research Laboratory [USA-CERL], August 1984).

(c) No request by the Contractor for equitable adjustment to the contract under this clause shall be allowed, unless the Contractor has given written notice required; provided, that the time prescribed in (a) above for giving written notice may be extended by the Contracting Officer.

(d) No request by the Contractor for an equitable adjustment to the contract for differing site conditions shall be allowed if made after final payment under this contract.

The Differing Site Conditions Clause (FAR 52.236-2) covers many important issues. To facilitate the development of logic and questions, these issues were divided conceptually into the following subareas:

- Payment
- Notice to government
- Government action
- Prejudice to government
- Nature of problem
- Contract provision
- Assumptions
- Superior knowledge
- Site inspection.

For each subarea, several questions were generated to cover the important aspects of the claim. Some examples of these questions are listed in the sample consultation session in Chapter 7. The next question generated depends on the answer to the previous question, following the logic of claim evaluation. Each of these areas is explained below, and the applicable section of FAR 52.236-2 is cited.

Payment

A Contractor that has accepted the final payment is not allowed to file a claim: "No request by the Contractor for an equitable adjustment to the contract for differing site conditions shall be allowed if made after final payment under this contract."

Notice to Government

The contractor must give proper notice of the differing site condition in order to maintain the possibility of entitlement: "The Contractor shall promptly, and before the conditions are disturbed, give a written notice to the Contracting Officer... ." Key aspects here are promptness, the receipt of the claim notice by the Government, and the written form of the notice.

Government Action

The contracting officer must look into the problem of the site condition as soon as he or she receives the notice so he or she can discuss the problem with the contractor and direct the actions to be taken by the contractor for the problem: "The Contracting Officer shall investigate the site Condition promptly after receiving the notice."

Prejudice to Government

If the failure to give written notice has not resulted in any prejudice to Government, the contractor's right to relief on a valid claim will not be barred. If the Government's interests have been impaired by the contractor's failure to give proper notice of the differing site conditions, it is unlikely that the Contractor will be entitled to compensation. To check if the Government was prejudiced, it is necessary to check if the government would have directed the same actions had it received the appropriate notice. If the Government would have directed different actions, then the Government was prejudiced.

Nature of Problem

Differing site condition claims can address only conditions which are physical in nature: "...subsurface or latent physical conditions at the site... ." This subarea also includes the evaluation of (1) whether the physical condition differs from the indicated or anticipated condition, (2) whether this difference caused an increase of contractor's cost or duration of the work, and (3) whether the contractor made a reasonable bid based on conditions indicated or to be anticipated.

Contract Provisions

The DSC clause gives two avenues of recovery for the contractor, depending on the contract provisions that exist in the particular case. A Type I case is characterized as "...subsurface or latent physical conditions at the site differing materially from those indicated in this contract... ." The contractor can be entitled to compensation if the actual conditions differ materially from the conditions explicitly mentioned in the contract. A typical example is the presence of rock or boulders in an excavation area at different elevations than had been indicated in the data available to bidders.

A Type II case is characterized in the clause as "...unknown physical conditions at the site, of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the contract." The contractor can also be entitled to a compensation if there is no specific indication of the condition in the contract documents and if it can be demonstrated that by following the standard construction practice the Contractor could not expect, nor detect, the presence of differing site conditions prior to bid time. A typical example is unexpected, corrosive groundwater at the site, which results in extensive damage to the contractor's de-watering equipment.

This subarea also covers questions to evaluate (1) if the contract provision included incorrect or inconsistent data, and (2) if a general exculpatory clause limiting the government's responsibility and liability was included. It is important to analyze carefully any directly or indirectly related exculpatory clauses that might be included in the contract. In general, clear and unambiguous disclaimers which address specific situations are the only reasons to prove the transfer of risk from the Government to the Contractor. A lawyer should review the exact language of these types of clauses to insure that any such clause is binding for the case being considered.

Assumptions

When there is no indication of condition in the contract document, or the contract provisions include erroneous information, the contractor can make assumptions that are generally accepted practice in the construction industry. These assumptions must be the same as a prudent contractor normally would use. These are described in part (a) of the clause as "...those ordinarily encountered and generally recognized as inherent in work of the character provided for in the contract."

Superior Knowledge

For the claim to be valid, the contractor must have had no knowledge, at the time of bid, that there were material differences between the actual condition and the indication in the contract (Type I cases), or between the actual condition and the expected condition (Type II cases). There are three possible sources of previous knowledge of the situation: (1) the Government (in the event that the Government obtains additional information about the situation after the request for bid and informs the contractor informally or issues an amendment), (2) prior knowledge of the contractor with an evidence indicating that the contractor had it (for example, a neighboring construction site had problems with unexpected boulders and the contractor heard about it); and (3) through a prebid site inspection as discussed below.

Site Inspection

It is unlikely that the contractor will be entitled to a compensation under a DSC claim if a reasonable site inspection would have provided information indicating the differing site conditions. An exception to this case would be a situation in which the Government hindered the site inspection.

Validating and Enhancing the System

Responses from the steering committee members have been incorporated in the field test version of CGS-DSC, which will be used for 1 year at two actual field offices, one military and one civil works. During the field testing, feedback from users will be collected, including their positive and negative reactions to the use of the system. This information will be used to validate the system and to make more enhancements if needed.

Although the field test version is based on the expert knowledge of the steering committee members, most users at the field test sites will be inexperienced personnel; these users may feel differently than the committee members about using the system and may provide very useful information for enhancing the system's user-friendliness and ease of use. After about 6 months of field testing, the steering committee and the users will meet and review their recommendations. After the user group meeting, the final version for the DSC module will be generated by incorporating users' suggestions. It will then be distributed to a number of field offices to be used in actual contract environments.

3 FUTURE RESEARCH AREAS

Even though USA-CERL attempted to avoid legal terminology in writing questions for users (mainly engineers) the CGS still requires some legal judgment as input. For example, the user has to make a legal judgment to characterize the difference as "material" or "substantial" to answer the question, "Does the physical condition substantially differ from the indicated condition?" It would be desirable to include more expert knowledge of lawyers on how to make a legal judgment on "materiality" and other similar topics.

Such material may soon be available: many law firms are actively exploring expert system technology, as evidenced at the first International Conference on Artificial Intelligence and Law held during 27 to 29 May 1987. Some are even creating expert systems groups to perform in-house research and development. For example, Watt, Tiedler, Killian, and Hoffar, a law firm in Vienna, VA, is developing the Microcomputer Expert System for Claim Identification and Evaluation, which is described in a conference paper presented by J. L. Lester.[7]

Another approach was presented in Victor's article, "How Much is a Case Worth,"[8] which demonstrated how a collection of decision trees, subjective probability assessments, and arithmetic can be used in evaluating claims. This application helps trial counsel assess the monetary worth of alternative courses of action.

Waterman, Paul, and Peterson[9] reviewed existing expert systems for legal decision-making potential and indicated that they expect more applications in the following areas: organizing case information, estimating case value and strategies for negotiation, monitoring legal data bases to find changes in the law, interpreting the law in the context of a problem, and producing legal documents. Thus, it seems that a great amount of research and development is expected in the near future. USA-CERL may decide to take advantage of this interest in the legal field and include more legal expertise in adding other types of construction contract claims to CGS. For example, including construction delay claims would involve integrating legal evaluation of claims with scheduling and network analysis. Design deficiency claims would involve integrating CADD systems with claims evaluation to examine drawings for deficiencies. These areas are challenging and hold potential benefit for the construction community.

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[7] J. L. Lester, "Microcomputer Expert System for Claim Identification and Evaluation," paper presented at the Fourth Conference on Computing in Civil Engineering, ASCE, October 1986.

[8] M. B. Victor, "How Much Is a Case Worth? Putting Your Intuition to Work to Evaluate the Unique Lawsuit," *Trial*, July 1984.

[9] D. A. Waterman, J. Paul, and M. Peterson, "Expert Systems for Legal Decision Making," *Expert Systems: The International Journal of Knowledge Engineering* (Learned Information, Oxford), Vol 3, No. 4 (October 1986), pp 212-226.

4 HARDWARE AND SOFTWARE REQUIREMENTS

This system requires an IBM-XT or -AT compatible computer that has minimum memory of 640 Kbytes and a hard disk with a minimum of 720 Kbytes free space. The software requirements are a Personal Consultant Plus Runtime diskette (Version 2.0) by Texas Instruments and a Claims Knowledge Base diskette, developed at USA-CERL. dBASE III Plus is also required if the user wants to search for a similar case from the case database.

5 OPERATION

Installing CGS

All the software required for the CGS is stored in two diskettes: the Personal Consultant Plus Runtime diskette, and the Claims Knowledge Base diskette. To install this software, copy the contents of both diskettes into a subdirectory on the hard disk, as follows.

1. Create a directory named \CLAIMS on the hard disk:

   type MD\CLAIMS

2. Change to the new directory:

   type CD\CLAIMS

3. Insert the Runtime diskette into drive A: and copy it to the new directory:

   type COPY A:*.*

4. Insert the Knowledge Base diskette into drive A: and copy to the new directory:

   type COPY A:*.*

Be sure to make backup copies of the Knowledge-Base diskette and Runtime diskette *either before or after* copying to hard disk.

Starting a Consultation Session

The system is ready to perform a consultation. To begin, follow these steps.

1. If you are not already in \CLAIMS, change directory:

   type CD\CLAIMS

2. Start CGS-DSC:

   type CONSULT CLAIMS
   press RETURN/ENTER

3. Continue after the title screen and display "Current Objectives" screen (shown below):

   press RETURN/ENTER

```
Current Objectives

                        CLAIMS GUIDANCE SYSTEM

This Claims Guidance System has been developed to provide:

     (1) Basic awareness of the issues surrounding t'e Differing Site Condition
         (DSC) clause,

     (2) Measuring device to ascertain contractor's chance of DSC entitlement, and

     (3) Documentation in the event the dispute comes to trial.

No computer system can solve the tough or grey cases.  If your case is in this grey
area, this system will provide the message - DIFFICULT-TO-DECIDE.  For these cases,
as in all instances, the advice of legal counsel will be necessary.  Additionally,
incorrect responses will result in faulty conclusions, so please read each question
carefully.  Even though great care has been taken to make the question clear, some
problems may be inevitable.  We would greatly appreciate any suggestions you may
have.

** End - RETURN/ENTER to continue
```

4. Display the next screen (shown below):

press RETURN/ENTER

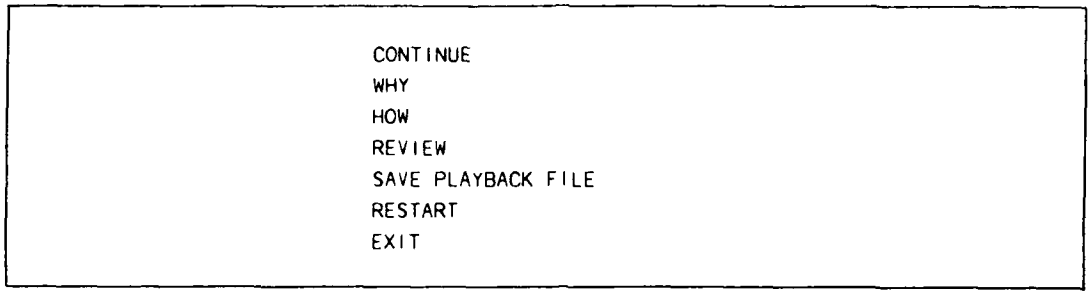
Question:

```
Are you considering a change order which is the result of a differing site con
dition (DSC)?

     YES
     NO


1.  Use the arrow keys or first letter of item to position the cursor.

2.  Press RETURN/ENTER to continue
```

Select "YES" if you want to use the system for a potential differing site condition claim. From here on, you will be prompted with questions directly related to the differing site condition claim under analysis. See Chapter 6 for guidance on how to answer the different types of prompts that can be encountered during a consultation session.

Exiting

At any time during the consultation, you can exit the system and stop the consultation. Press the F2 key, and the menu shown below will be displayed (features are discussed in detail in "Options' section of Chapter 6):



Move the cursor by pressing down arrow to reach EXIT, or type E, and press the RETURN/ENTER key.

6 GUIDELINES ON RUNNING A CONSULTATION SESSION

Typical Prompts

You will encounter three types of prompts during a consultation session with CGS-DSC: yes/no, multiple choice, and explanation. An example of each is shown below:

"Yes/no" Prompt

You will see this type of prompt when there is a question that can only be answered yes or no. Some of these questions will allow you to choose from two selections:

YES
NO.

Other questions of this type will allow you to choose from three, four, or five selections, with different degrees of certainty.

Three selections are:

DEFINITELY-YES
NOT-SURE
DEFINITELY-NO.

Four selections are:

DEFINITELY-YES
PROBABLY-YES
PROBABLY-NO
DEFINITELY-NO.

Five selections are:

DEFINITELY-YES
PROBABLY-YES
NOT-SURE
PROBABLY-NO
DEFINITELY-NO

An example question is shown below:

Question:

```
Was the Government's collection of information
for defense prevented by the inadequate notice?

    DEFINITELY YES
    PROBABLY YES
    PROBABLY NO
    DEFINITELY NO

1.  Use the arrow keys or first letter of item to position the cursor.
2.  Press RETURN/ENTER to continue
```

Multiple Choice Prompt

You will see this prompt when you must select the answer to a question from a given list of possible options. Use the up/down arrow keys to move the cursor to the option you want. Record your answer by pressing the RETURN/ENTER key. An example question is shown below:

Question:

```
Who was the first person or group to receive information regarding the claim?

        1 RCO/COR OR AUTHORIZED REPRESENTATIVE
        2 OTHER CORPS PERSONNEL
        3 REPRESENTATIVE OF USING AGENCY
        4 REPRESENTATIVE OF MILITARY
        5 NONE OF ABOVE

1.  Use the arrow keys or first letter of item to position the cursor.
2.  Press RETURN/ENTER to continue
```

Explanation Prompt

You will see the explanation prompt when the answer to a question consists of one or more words that cannot be anticipated by the system. Typically, this situation occurs when further explanation to a previous answer is requested, or when the system is prompting for a name. If you know the answer, type it and press the RETURN/ENTER key. A new blank line will appear that you can use to type more information if necessary. Once you have typed sufficient information, press the RETURN/ENTER key on a blank line to continue. If you don't know the answer to the question, you must type something like "NOT KNOWN" or "I DO NOT KNOW" and press RETURN/ENTER on the second blank line. An example is shown below:

Question:

```
Please enter the name of the contractor ....

        De Mauro Construction Corp

        ____________________________________

1.  Type your response.
2.  Press RETURN/ENTER for another line.
3.  Press RETURN/ENTER on a blank line to continue.
```

Options

The F2 function key provides access to several important options. If you press F2 key when a question is displayed on the screen, you will see one of the following menus. Use the up/down arrow keys to select an option, or type the first letter of the option, then press the RETURN/ENTER key to record your selection. Each feature is discussed in detail below.

CONTINUE
WHY
HOW
REVIEW
SAVE PLAYBACK FILE
RESTART
EXIT

If you press F2 at the Current Objectives screen (shown on pg 30), the following options will be on the menu:

CONTINUE
GET PLAYBACK FILE
EXIT

If you press F2 at the Conclusion screen (at the end of a consultation), the following menu will be displayed:

CONTINUE
HOW
PRINT CONCLUSION
REVIEW
SAVE PLAYBACK FILE
EXIT

WHY

This option is designed to explain why the system is prompting for certain information. An example of a WHY screen is shown below:

Question:

```
Who was the first person or group to receive information regarding the claim?

          WHY

Who was the first person to receive the notice is needed to determine if respon
ible person did receive the notice.

RULE 008

In order to check if the contractor complied fully with the requirements for the
notice the following information is necessary regarding:

(1)  If responsible personnel received the notice and the date received,
(2)  If the form of notice was adequate (written or oral)
(3)  If the notice was prompt.

     ** End - RETURN/ENTER to continue
```

HOW

This option explains how the system reached conclusions. HOW is useful during consultation if you need to understand the progress of the analysis in the system. You will see a list of parameters or intermediate steps of the analysis performed so far. To select any of these parameters, follow the instructions below:

1. With the up/down arrow keys, locate the cursor in front of the parameter.

2. With the right arrow key, move the cursor to the Yes column. This will leave a marker on that location.

3. Repeat steps 1 and 2 for as many parameters as you want.

4. Press the RETURN/ENTER key.

For each parameter you selected, a screen will appear that contains an internal rule number and an explanation on how it was concluded. For each selected parameter, all the rules used to determine the value of that parameter will be displayed. An example of a HOW screen is shown below:

```
HOW

the contractor complied fully with notice requirement:

     Determined to be:  YES
     ........by using RULE021

contractor did comply fully with notice requirement

IF

contractor notified the government promptly
contractor notified in written or oral form
contractor notified the responsible receiver

     ** End - RETURN/ENTER to continue
```

REVIEW

This option allows you--at any time--to review the prompts and answers you have given during a consultation. You can just observe the answers given or you can modify them. When you access this option, a list of prompts and answers to the prompts will appear on the screen. If you intend just to observe the answers given during the part of the consultation completed so far, press the RETURN/ENTER key after reviewing the screen to continue the consultation.

If you intend to modify any of the answers provided, follow the steps below.

1. With the up/down arrow keys, locate the cursor in front of the prompt whose answer you want to change.

2. With the right arrow key, move the cursor to the Yes column. This will leave a marker on that location.

3. Repeat steps 1 and 2 for as many prompts as you want to change.

4. Press the RETURN/ENTER key to respond to the selected questions with different answers. The system will restart and display all the unchanged questions and answers, then the selected questions will be redisplayed on the screen for a different answer. Continue with all the selected questions until the system reaches the conclusion.

PRINT CONCLUSIONS

This option will give you a summary of the consultation session and a listing of the conclusions reached. You can direct the output produced by this option to a disk file or to a printer. After selecting this option, you will select the printer where your output will be sent.

If you choose to direct the output to a disk file, you will have to decide whether to save it in an existing file or in a new file. If you save it in an existing file, the previous contents of this file will be replaced by the new output. The files where the outputs of PRINT CONCLUSIONS are saved are identified by the extension .REC. The system automatically adds this extension, so you do not need to enter it with the filename.

SAVE PLAYBACK FILE

This option allows you to save a consultation session. All the answers you have given up to the time you select this option will be saved on disk. The files used to store a complete playback file end with the extension .PBK. You can save the playback file in an existing file or in a new file. If you choose the former alternative, the contents of the old file will be replaced by the contents of the new playback file.

GET PLAYBACK FILE

With this option, you can load the contents of a playback file and rerun a previous consultation session. It allows you to modify any of the answers provided in the loaded playback file.

After you access the option, the names of existing playback files will be displayed on the screen. Select the one you want with the up/down arrow keys and then press the RETURN/ENTER key. A list of prompts and answers given to the prompts will appear on the screen, equivalent to the one obtained with the REVIEW option. From here on, proceed with the instructions provided for the REVIEW option.

EXIT

This option allows you to terminate a session at any point. If you want to quit, press the F2 key and select EXIT. It aborts the session and returns you to DOS.

CONTINUE

This option lets you continue the session at the same point where you interrupted it by pressing the F2 key. It can also be used to start a new session after the system displays the conclusion at the end of a session.

HELP

The F1 function key provides help messages relevant to the question displayed on the screen. Some questions that require additional clarification are provided with a HELP feature. To get HELP, press the F1 key before responding to the prompt in question. If you request HELP for a prompt for which it is unavailable, a small window will appear in the center of the screen indicating that the HELP feature does not exist in this case. Whenever HELP feature is available for a question, you will see "PRESS F1 KEY FOR MORE EXPLANATION" under the question. After you see the HELP window, press the RETURN/ENTER key to go back and respond to the prompt you were uncertain about and enter the answer to the question. An example of a HELP screen is shown below:

Question:

```
Should the prudent contractor rely on these incorrect references?

PRESS F1 KEY FOR MORE EXPLANATION

Help

PRUDENT:

Prudent Contractor:  If most contractors with similar experience/knowledge,
and under the same circumstances, would agree with the contractor in question,
the contractor is said to be a prudent one.

A Prudent Contractor would:

(1)  Use his past experience and knowledge as a basis for all his judgments
     and assumptions.

(2)  Act as most of his peers would, given the same set of circumstances.

(3)  Submit contract bid based on fair reading of representations indicated
     in Government contract and on adequate site inspection.

(4)  Make assumptions using his past experience and knowledge when conducting
     a site inspection.

(5)  Make assumptions using his past experience and knowledge when reading the
     contract drawings, specs., and therefore would not rely on obvious flaws
     noted in the contract.
```

Graphic Support

During the consultation, the system will provide graphic support if the user asks to see the graphic display of the information flow and the steps he/she has gone through. At the beginning of the consultation, the user will be asked:

> The Claims Guidance System has been equipped with graphics support to show your progress through the system. If you would like to be prompted for this type of graphic support at various stages of progress, enter yes. If you never want to see this support, enter no.

If you answer yes to the above question, at various points you will be asked if you would like to view the graphic display. If you answer yes at the beginning of the system, the diagram shown in Figure 1 will be displayed. This is a simplified version of logic diagram shown in Appendix A.

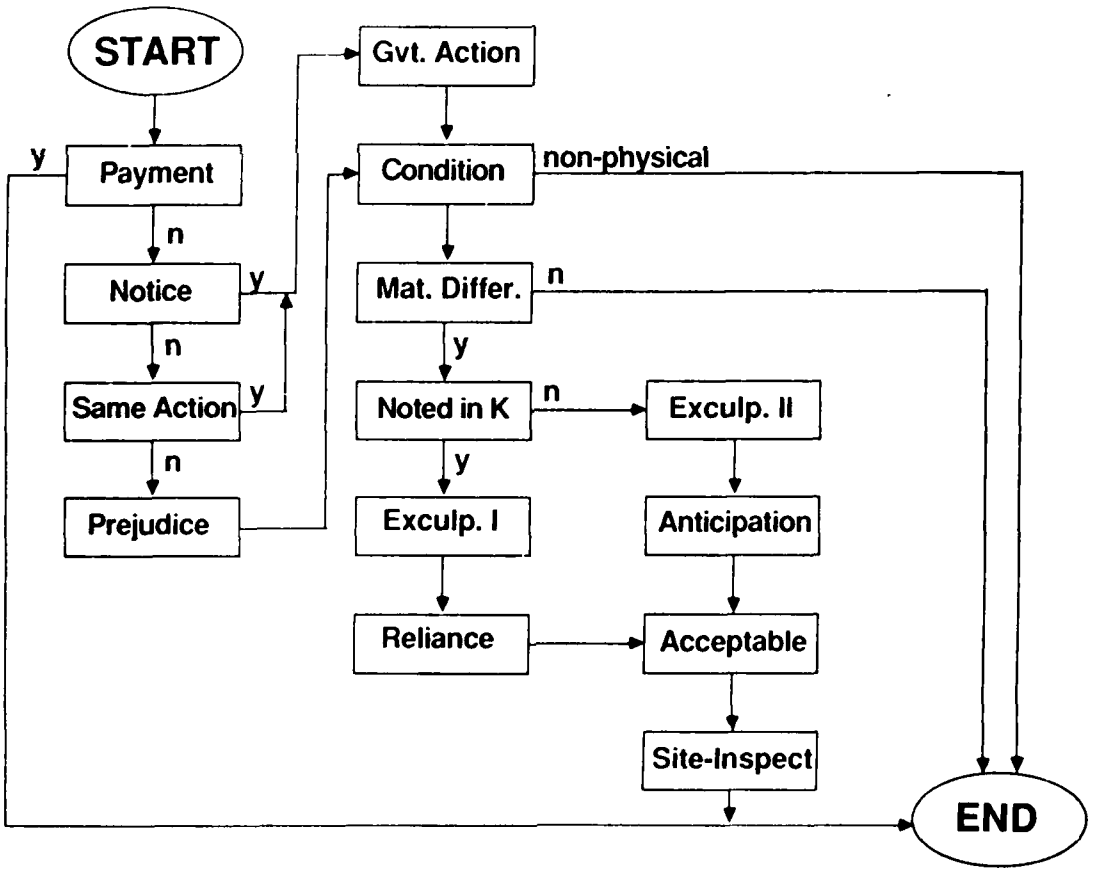


Figure 1. Simplified CGS logic diagram used in on-line graphic support.

Cases Database

At the end of the consultation, the system attempts to match the situation described by the user with a case which has similar characteristics from the case database. When the system finds a similar case with the described situation, a short summary of this case is presented on the screen. If the system does not find a similar case from the case database, it will display a message that no case was found.

The current case database for the DSC has 21 cases retrieved from Lexis System.* These 21 cases are briefed in Appendix C. A citation is included at the end of each case brief so that a user can read more details of the case, if needed.

Question:

Now the Claims Guidance System will search through the database for a case similar to the one represented by your response. Please select YES, then press ENTER when the dBASE III logo appears.

If a similar case was found, a short summary of the selected case will be displayed on the screen as below:

C. H. Leavell Case:

Summary:

Contractor entered into a contract to construct five buildings at Lackland Air Force Base, Texas for $15,000,000. Contractor DSC equitable adjustment was denied since he must assume the risk of his own unreasonable interpretations of the contract indications when a simple inquiry to the Government could have clarified the borings that were inconsistent or unclear. Contract's borings in dicated that subsurface soil was practically impervious, and some of drawing's symbols were unclear. The Contractor's assumption that unclear symbols repre sented impervious soils and that water would therefore not enter holes after drilling was unreasonable.

*Lexis System is a trademark of Head Data Central, Inc.

7 A SAMPLE CONSULTATION SESSION

This section gives you a chance to follow a consultation session with an example case. Logic diagrams are included in Appendix A to help you follow the flow of the information in the system. If you have a potential claim situation which is different from this example case you may be asked different questions. If you want to know the flow of information and questions involved, you may want to try to follow the appropriate path in the logic diagrams.

The sample consultation session presented here uses a fictitious case; its summary is as follows (subdivided along the lines discussed in Chapter 2):

- Payment: Payment has not been offered to the Contractor.
- Notice to Government: Contractor informed the RCO/COR of the differing site condition in written form one year after completing work on problem.
- Government Action: RCO/COR could not investigate the site condition because the Contractor did not notify the Government until after completing the work on the problem.
- Prejudice to Government: Government was prejudiced because the Government would not have directed the same action if the Contractor had informed the Government about the problem.
- Nature of Problem: The condition is related to the physical conditions at the site. The Contractor assumed that the unclear symbol represents impervious soils and the water would not enter holes after drilling, but extensive casing was required due to the pervious nature of the soils encountered. This physical condition existed before the contract was awarded and is substantially different from the indicated condition. The condition caused an increase in the Contractor's cost and duration, and he used acceptable practices.
- Contract Provision: The condition is specifically addressed or implied in contract documents, but these references are unclear and ambiguous. There is an exculpatory clause limiting the Government's liability, but it is not extremely specific to the condition encountered.
- Assumptions: A prudent contractor should not normally rely on the unclear indications. A prudent contractor would ask the Government and clarify the problem.
- Superior Knowledge: The Contractor could not reasonably have known about the situation prior to bid.
- Site Inspection: A reasonable site inspection would have provided information to detect the condition. The Contractor did not perform a reasonable site inspection. The Government action did not hinder the site inspection.

When you type "CONSULT CLAIMS", first the title screen then the Current Objectives screen will be displayed. The title screen is a graphic image which was created by PC Story Board (from IBM), then captured and imported into Personal Consultant Plus. The Current Objectives screen is a text screen as shown below:

```
Current Objectives

                                CLAIMS GUIDANCE SYSTEM

This Claims Guidance System has been developed to provide:

   (1)  Basic awareness of the issues surrounding the Differing Site Condition
        (DSC) clause,

   (2)  measuring device to ascertain contractor's chance of DSC entitlement, and

   (3)  documentation in the event the dispute comes to trial.

No computer system can solve the tough or grey cases.  If your case is in this
grey area, this system will provide the message - DIFFICULT-TO-DECIDE.  For
these cases, as in all instances, the advice of legal counsel will be necessary.
Additionally, incorrect responses will result in faulty conclusions, so please
read each question carefully.  Even though great care has been taken to make the
question clear, some problems may be inevitable.  We would greatly appreciate
any suggestions you may have.

** End - RETURN/ENTER to continue
```

The first question shown below checks if you have a potential differing site condition claim.

```
Q: Are you considering a change order which is the result of a differing site
   condition (DSC)?


        YES
        NO

1.  Use the arrow keys or first letter of item to position the cursor.
2.  Press RETURN/ENTER to continue.
```

Use the up/down arrow keys to move the cursor to the option you want. During the consultation, you can encounter three different types of prompts with the CGS: multiple choice, explanation/name of something, and yes/no (with different degrees of certainty).

Select "YES" if you want to use the system for a potential differing site condition claim. The next question is about the availability of graphic support:

Q: The Claims Guidance System has been equipped with graphics support to show your progress through the system. If you would like to be prompted with this type of graphic support at various stages of progress, enter yes. If you would not ever like to use this support, enter no.

After this question the system directs you to obtain certain materials that you may need to refer while using the system, as shown below:

```
Before proceeding with the Claims Guidance System analysis, you need to have
the following if available:

   1.  Contractor's letter asserting the DSC

   2.  Contract with plans, specifications, and drawings

   3.  Bid abstract

   4.  Memorandum of site inspection

   5.  Other pertinent documents.
```

From here on, you will be prompted with questions directly related to the differing site condition claim under analysis. See Chapter 6 for more detailed guidance on how to answer the different types of prompts that can be encountered during a Consultation session.

Next, you are asked to type in the name of the contractor as shown below:

Q: Please enter the name of the contractor ....

Smith Construction Corp

1. Type your response.
2. Press RETURN/ENTER for another line.
3. Press RETURN/ENTER on a blank line to continue.

The above question is an example of explanation/name prompt. You are to answer the question in one or more words that cannot be anticipated by the system. Typically, this situation occurs when further explanation to a previous answer is requested, or when the system is prompting for a name.

After entering the contractor's name, questions concerning the contract number, contract description, and brief description of the contractor's assertion will be asked.

Q: Please enter the contract number....

DACA45-87-C-0001

Q: Please provide the description of the contract...

Aircraft Maintenance Facility

Q: Please give a brief statement of the contractor's assertion....

The contractor assumed the unclear symbol represented impervious soils and the water would not enter holes after drilling, but extensive casing was required due to the pervious nature of the soils encountered.

After the description of the contractor's assertion, questions concerning the final payment will be displayed, as below. For all questions displayed below, the answers are shown in the parentheses. However, in actual consultation, you will move the cursor to the selection and record it with the RETURN/ENTER key.

Q: Has the contractor signed the final payment release without condition? . . .(NO)

Q: Was the final payment sent to the contractor? . . . . . (NO)

For both of the above questions, you are to answer yes/no with 100 percent certainty. If you answered NO to both questions above, the next step is to find if the contractor had complied fully with notice requirements. In order to check if appropriate notice was given, the following questions will be asked:

Q: Did the contractor inform the government about the problem prior to asserting a differing site condition?. . . . . (YES)

Q: How did the contractor inform the Corps of the problem?. . .(WRITTEN)

Q: Please enter the name of the person that received the information first. . .

JOHN SMITH

Q: Please enter the date the information was received. . .

JULY 25, 1985

Q: Who was the first person or group to receive information regarding the claim? . . . . . (RCO/COR OR AUTHORIZED REPRESENTATIVE)

At any point before answering a question, you can invoke the WHY option asking the system to explain why it is prompting for this information. The WHY screen for the last question above is shown as an example:

```
WHY

Who was the first person to receive the notice is needed to determine if
responsible person did receive the notice.

RULE 008
In order to check if the contractor complied fully with the requirements
for the notice the following information is necessary regarding:

(1)  if responsible personnel received the notice and the date received,

(2)  if the form of notice was adequate (written or oral)

(3)  if the notice was prompt.

   ** End - RETURN/ENTER to continue
```

Q: When did the contractor first inform the government about the problem? . . . . . (AFTER COMPLETING WORK ON PROBLEM)

From the answers shown above, a conclusion can be made that the contractor has NOT complied fully with notice requirements by informing after completing work on problem, even though the responsible personnel was informed in a written form. Now you need to check if the government's action was adequate and if the government was prejudiced with the following questions:

Q: Did the Government investigate the asserted Differing Site Condition?. . . . . .(NO)

Q: Would the Government have directed the same action had it received appropriate notice? . . . . . .(NO)

Q: Could the Government have arrived at a less expensive and/or less time consuming solution? . . . . . (PROBABLY YES)

Q: Was the physical evidence regarding the contractor's assertion obscured due to the passage of time? . . . (DEFINITELY YES)

Q: Was the Government's collection of information for defense prevented by the inadequate notice? . . . . . (DEFINITELY YES)

At this point, the system will display the simplified logic diagram of information flow indicating your progress as shown in Figure 2:

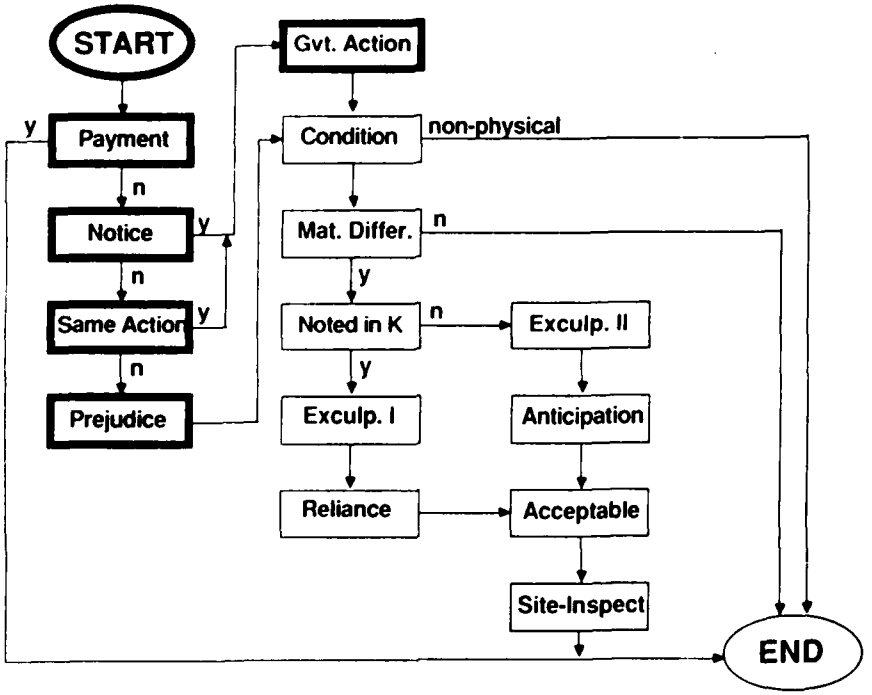


Figure 2. Simplified logic diagram highlighted to show how far the user has progressed at this point in the sample consultation.

The next step in the CGS is to check the nature of the problem to see if this situation fits into the DSC claims; that is, you must determine if there was a material difference in physical condition from the contract indications or from what should have been anticipated.

Q: Is the asserted DSC directly related to the physical conditions at the site?. . . . . .(YES)

Q: Did the asserted DSC exist before the contract award? . . . . . .(YES)

Q: Does the physical condition substantially differ from the indicated/anticipated condition?. . . . . (PROBABLY YES)

Q: Please describe why you believe that the condition differs substantially. . . . .

Because the assumption that the contractor made about the unclear symbol caused a substantial increase of cost.

Q: Did the asserted DSC increase the contractor's costs/duration? . . . . .(YES)

Q: Did the contractor use acceptable practices or standards of workmanship to alleviate the DSC? . . . . . .(YES)

Q: Are there contract indications or notes on drawings that pertain to this situation?. . . . . (YES)

Q Do these references specifically address, imply or infer this situation?. . . . . (PROBABLY YES)

Q: Please provide the location of these references. . . . .

PARA 5.a

Q: Please explain in detail why you believe that the contract does either implicitly or explicitly make reference to the alleged differing site condition claim. . . . .

Because the symbol that the contractor misinterpreted as impervious soils could have been clarified if the contractor had asked the Government. Also more detailed test was noted on the contract as available.

Q: Are these references incorrect?. . . .(NO)

Q: Are there obvious inconsistencies or ambiguities among two or more references? . . (PROBABLY YES)

Q: Would a simple inquiry from a prudent contractor to the Government have revealed the difference? . . . . . (YES)

Q: Is there a clause that limits the Government's responsibility and liability by stating that indications on the contract are only representation of conditions and should not be a basis for differing site condition?. . .(YES)

Q: Is this clause extremely specific to the condition encountered?. . . . . (NO)

Q: Did the contractor rely on the incorrect references in preparing the bid? . . . (YES)

Q: Should a prudent contractor rely on these incorrect references? . . . (DEFINITELY NO)

At any time during the consultation before answering a question, you can invoke a HELP screen by pressing the F1 key, which displays an explanation of the question, as additional clarification. To display the HELP screen, however, an explanation for each question had to be generated and included during the software development. If a question is simple and there is no need for more explanation to be added, then a message that indicates that there is no help for this question is given. The HELP screen for the above question is shown below:

HELP

PRUDENT:

Prudent Contractor: If most contractors with similar experience/ knowledge, and under the same circumstances, would agree with the contractor in question, the contractor is said to be a prudent one.

Prudent Contractor would:

(1) Uses his past experience and knowledge as a basis for all his judgments and assumptions.

(2) Acts as most of his peers would given the same set of circumstances.

(3) Submits contract bid based on fair reading of representations indicated in government contract and adequate site inspection.

(4) Makes assumptions utilizing his past experience and knowledge when con ducting a site inspection.

(5) Makes assumptions utilizing his past experience and knowledge when reading the contract drawings, specs., and, therefore, not rely on obvious flaws noted in the contract.

Q: Please explain why a prudent contractor should not rely on the incorrect references. . . . . .

Any prudent contractor would clarify the unclear symbol on the drawing instead of assuming like this contractor. . .

After this question is answered, an intermediate conclusion is displayed with a case citation as shown below:

It seems that the contract document indicated the condition specifically encoun tered but with erroneous or ambiguous information, therefore, a TYPE I condition is the most probable.

An example case of contract document deficiency is Veteran Administration Con tract Appeals Board case No. 1095, dated May 1975. The bidding documents con tained the language by which a reasonable prudent contractor would have been led to believe that it was possible to pass ductwork through the ceilings contain ing radiant heating pipes by avoiding the heating elements, and it was not pos sible for the contractor to discover at the time of prebid site inspection that the situation was otherwise. The contractor was entitled to an equitable adjust ment for miscalculation in his bid due to the deficiency of the contract document.

Q: Are there contract indications or notes on drawings that pertain to this situation?. . . . . (YES)

Q Do these references specifically address, imply or infer this situation?. . . . . (PROBABLY YES)

Q: Please provide the location of these references. . . . .

PARA 5.a

Q: Please explain in detail why you believe that the contract does either implicitly or explicitly make reference to the alleged differing site condition claim. . . . .

Because the symbol that the contractor misinterpreted as impervious soils could have been clarified if the contractor had asked the Government. Also more detailed test was noted on the contract as available.

Q: Are these references incorrect?. . . .(NO)

Q: Are there obvious inconsistencies or ambiguities among two or more references? . . (PROBABLY YES)

Q: Would a simple inquiry from a prudent contractor to the Government have revealed the difference? . . . . . (YES)

Q: Is there a clause that limits the Government's responsibility and liability by stating that indications on the contract are only representation of conditions and should not be a basis for differing site condition?. . .(YES)

Q: Is this clause extremely specific to the condition encountered?. . . . . (NO)

Q: Did the contractor rely on the incorrect references in preparing the bid? . . . (YES)

Q: Should a prudent contractor rely on these incorrect references? . . . (DEFINITELY NO)

At any time during the consultation before answering a question, you can invoke a HELP screen by pressing the F1 key, which displays an explanation of the question, as additional clarification. To display the HELP screen, however, an explanation for each question had to be generated and included during the software development. If a question is simple and there is no need for more explanation to be added, then a message that indicates that there is no help for this question is given. The HELP screen for the above question is shown below:

HELP

PRUDENT:

Prudent Contractor: If most contractors with similar experience/ knowledge, and under the same circumstances, would agree with the contractor in question, the contractor is said to be a prudent one.

Prudent Contractor would:

(1) Uses his past experience and knowledge as a basis for all his judgments and assumptions.

(2) Acts as most of his peers would given the same set of circumstances.

(3) Submits contract bid based on fair reading of representations indicated in government contract and adequate site inspection.

(4) Makes assumptions utilizing his past experience and knowledge when con ducting a site inspection.

(5) Makes assumptions utilizing his past experience and knowledge when reading the contract drawings, specs., and, therefore, not rely on obvious flaws noted in the contract.

Q: Please explain why a prudent contractor should not rely on the incorrect references. . . . . .

Any prudent contractor would clarify the unclear symbol on the drawing instead of assuming like this contractor. . .

After this question is answered, an intermediate conclusion is displayed with a case citation as shown below:

It seems that the contract document indicated the condition specifically encoun tered but with erroneous or ambiguous information, therefore, a TYPE I condition is the most probable.

An example case of contract document deficiency is Veteran Administration Con tract Appeals Board case No. 1095, dated May 1975. The bidding documents con tained the language by which a reasonable prudent contractor would have been led to believe that it was possible to pass ductwork through the ceilings contain ing radiant heating pipes by avoiding the heating elements, and it was not pos sible for the contractor to discover at the time of prebid site inspection that the situation was otherwise. The contractor was entitled to an equitable adjust ment for miscalculation in his bid due to the deficiency of the contract document.

Q: Should the contractor have known about the DSC prior to bidding?. . . . . .(DEFINITELY NO)

Q: Would a reasonable site inspection have provided information to detect the DSC?. . .(YES)

Q: Did the contractor conduct a reasonable site inspection prior to bid? . . . . (DEFINITELY NO)

Q: Did any act of the Government hinder the site inspection? . . .(NO)

Q: Now the Claims Guidance System will search through the database for a case similar to the one represented by your responses. Please select YES, then press ENTER when dBASE III logo appears. . . . . .(YES)

The system will search for a similar case to the situation described by the user. It may take a few minutes to perform the dBASE III commands to find the appropriate case. The user will see the dBASE III logo and license agreement statement. This was a necessary step to use dBASE III program in searching the case. Press the RETURN/ENTER key when this logo is presented, then the short summary of the retrieved case from the cases database will be displayed as shown below:

C. H. Leavell Case:

Summary:

Contractor entered into a contract tc construct five buildings at Lackland Air Force Base, Texas for $15,000,000. Co..tractor DSC equitable adjustment was denied since he must assume the risk of his own unreasonable interpretations of the contract indications when a simple inquiry to the Government could have clarified the borings that were inconsistent or unclear. Contract's borings indicated that subsurface soil was practically impervious, and some of the drawing's symbols were unclear. The Contractor's assumption that unclear sym bols represented impervious soils and that water would therefore not enter holes after drilling was unreasonable.

The next question will be on important issues involved in reaching a conclusion about the contractor's chance of entitlement.

Q: This is the end of this series of questions. Would you like to view issues that are pertinent in reaching the conclusion? . . . . (YES)

If you answer yes to the above question the graphic representation of important factors will be shown as in Figure 3.

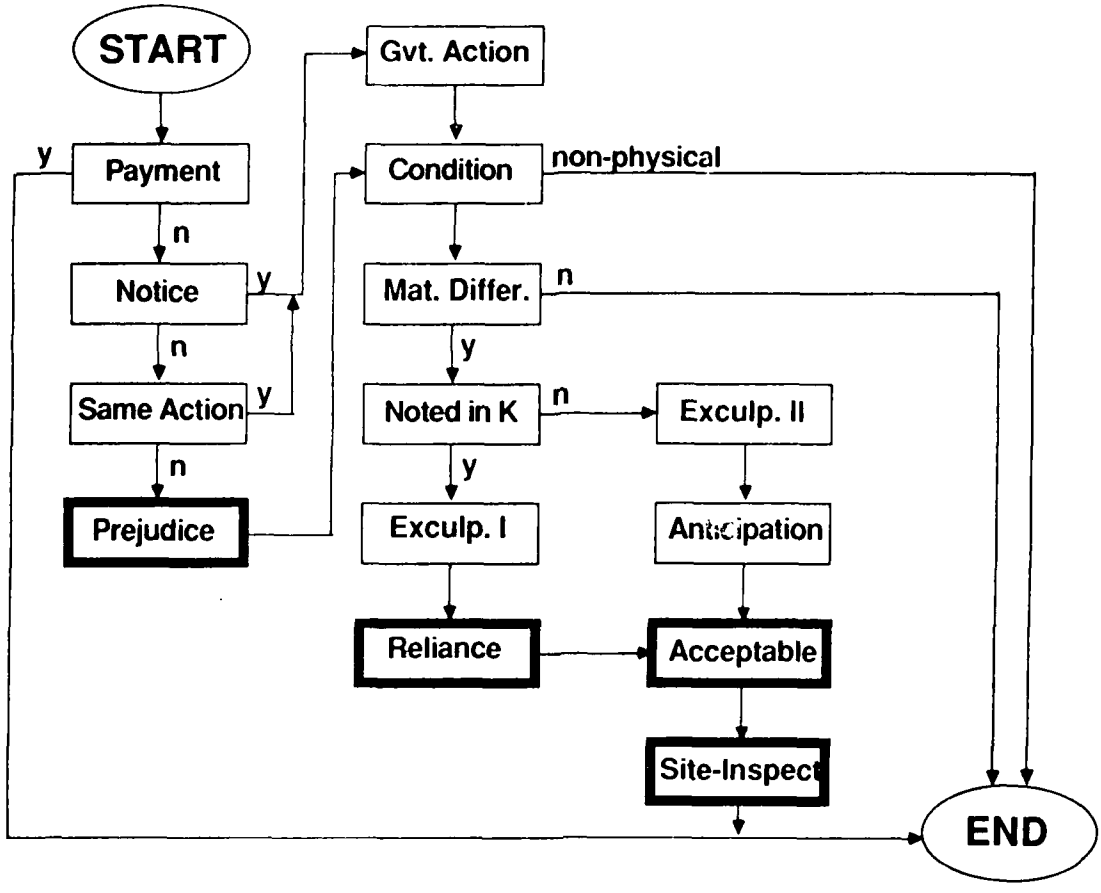


Figure 3. Simplified logic diagram highlighted to show the key factors contribution to the conclusion in the sample consultation.

This is the end of consultation for this case. After the last question is answered and the graphics are shown, the conclusion screen is displayed as shown below:

```
CONCLUSIONS

Possible conclusions for entitlement are the following:

    1.  VERY-POOR-CHANCE
    2.  POOR-CHANCE
    3.  DIFFICULT-TO-DECIDE
    4.  FAIR-CHANCE
    5.  GOOD-CHANCE
    6.  EXCELLENT-CHANCE

The chance of entitlement for this contractor is as follows:  VERY-POOR-CHANCE
```

CLOSING:

The information which you have just provided will be of great assistance and importance in the future if the dispute comes to trial.

Hopefully, you have gained insight from running this system, which guided you to consider the issues surrounding the DSC clause.

Also, the conclusion of this system has provided you with a measuring device to ascertain the contractor's chance of DSC entitlement. This conclusion has given a fair indication of the outcome in court based on your responses. If the conclusion was not either excellent-chance or very-poor-chance, then the conclusion was somewhere in between, a grey area. In this case especially, seek legal counsel.

In all cases make sure that this information is saved in a file or printed in a report. The next step is to take the information to your superior officer to be reviewed.

After the closing statement is displayed, press the RETURN/ENTER key to see the menu, then select PRINT CONCLUSIONS from the menu to print the questions and answers you have entered, along with the conclusion. You can also save all your answers in a file by selecting SAVE PLAYBACK FILE, so you can review it later.

4 CONCLUSION

This report has described the development of an operational prototype for the Differing Site Condition module of the Claims Guidance System (CGS-DSC). This module is intended (1) to provide an inexperienced engineer with prelegal assistance in analyzing DSC claims, (2) to serve as a tool for documenting the necessary information for a potential claim, and (3) to help train new field office personnel in the claims process.

User instructions have been presented which explain the module's features and how to use them, along with sample screens and an entire sample consultation session.

CGS-DSC uses the Personal Consultant Plus software, an expert system shell from Texas Instruments, which runs on IBM-XT and -AT compatible computers. The system prompts the user for information on the claim in question, then compares the responses to cases in its data base. If it finds a match, it presents the conclusions that were reached in the case on record. Menu options allow the user to find out why the system is asking a particular question, to ask how it reached the conclusion it displayed, to review/modify answers to previous questions, to save and rerun an entire consultation session, and to print a summary of a session and its conclusions.

In the future, the system will be field tested, then corrected and enhanced based on the field tests, and finally distributed to Corps field offices.

CITED REFERENCES

Diekmann, J. E., and Kruppenbacher, T. A., "Claims Analysis and Computer Reasoning," *Journal of Construction Engineering and Management*, Vol 110, No. 4 (American Society of Civil Engineers [ASCE], 1984), pp 391-408.

Diekmann, J. E., and Nelson, M. C. "Construction Claims: Frequencies and Severity" *Journal of Construction Engineering and Management*, Vol 111, No. 1 (SCE, 1985) pp 74-81.

Kruppenbacher, T. A., *The Application of Artificial Intelligence to Contract Management*, USA-CERL Technical Manuscript P-166/ADA146681 (U.S. Army Construction Engineering Research Laboratory, August 1984).

Lester, J. L., "Microcomputer Expert System for Claim Identification and Evaluation," paper presented at Fourth Conference on Computing in Civil Engineering, ASCE, Oct 1986.

Mogren, E. T., "The Causes and Costs of Modification to Military Construction," Master Thesis, U.S. Army Command and General Staff College, May 1986.

Richer, M. H., "An Evaluation of Expert System Development Tool," *Expert Systems: The International Journal of Knowledge Engineering*, Learned Information, Oxford, Vol 3, No. 3 (July 1986), pp 166-183.

Victor, M. B., "How Much Is a Case Worth? - Putting Your Intuition to Work to Evaluate the Unique Lawsuit," *Trial*, July 1984.

Waterman, D. A., Paul, J., and Peterson, M., "Expert Systems for Legal Decision Making," *Expert Systems: The International Journal of Knowledge Engineering*, Learned Information, Vol 3, No. 4 (October 1986), pp 212-226.

UNCITED REFERENCES

Contract Clauses: Construction-inside the U.S., Issued by the Department of the Army, Corps of Engineers, Edition of 17 November 1986, Ohio River Division, ORDCT.

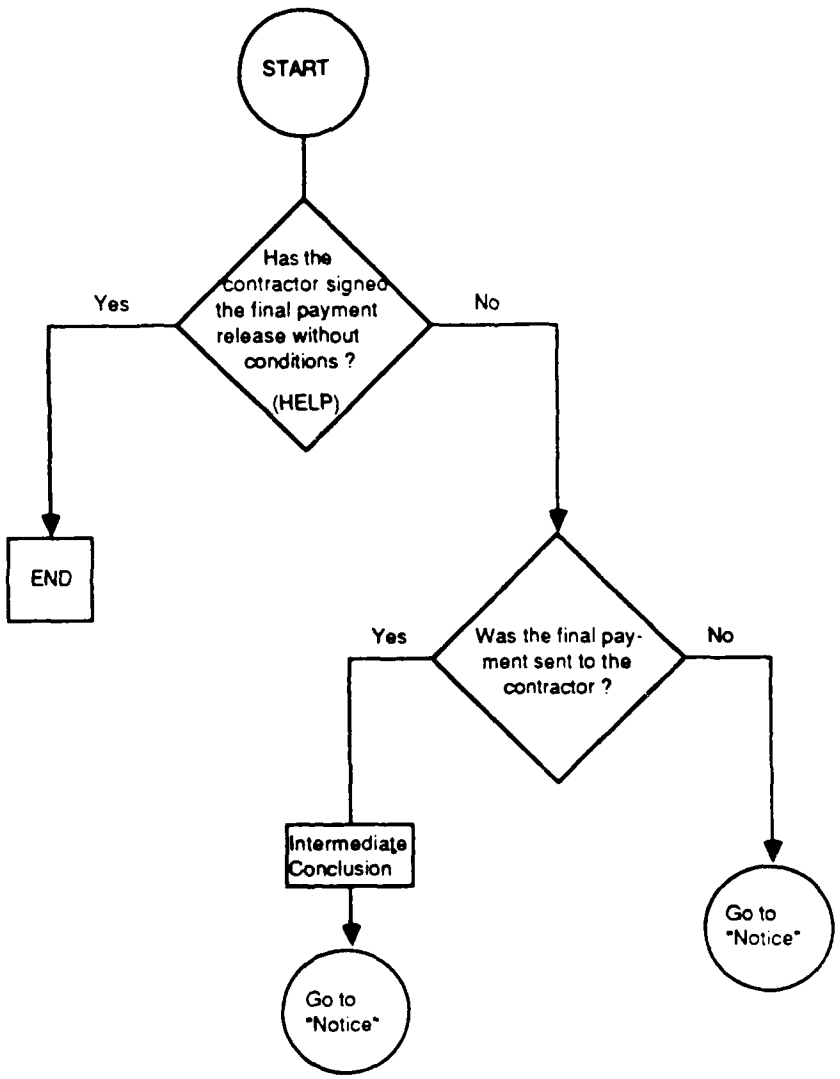
Hayes-Roth, F., Waterman, D. A., and Lenat D. B. (Eds), *Building Expert Systems*, Addison-Wesley, 1983.

Lester, J. L., "Lawyer on a Microchip," *Civil Engineering*, (ASCE, June 1987), pp 68-69.

APPENDIX A:

LOGIC DIAGRAM FOR CGS-DSC

Frame: Payment



Note:
The system stops asking questions when the END symbol is reached.
Further analysis is inappropriate.

Figure A1. Start and final payment frame. Determines whether final payment has been made.

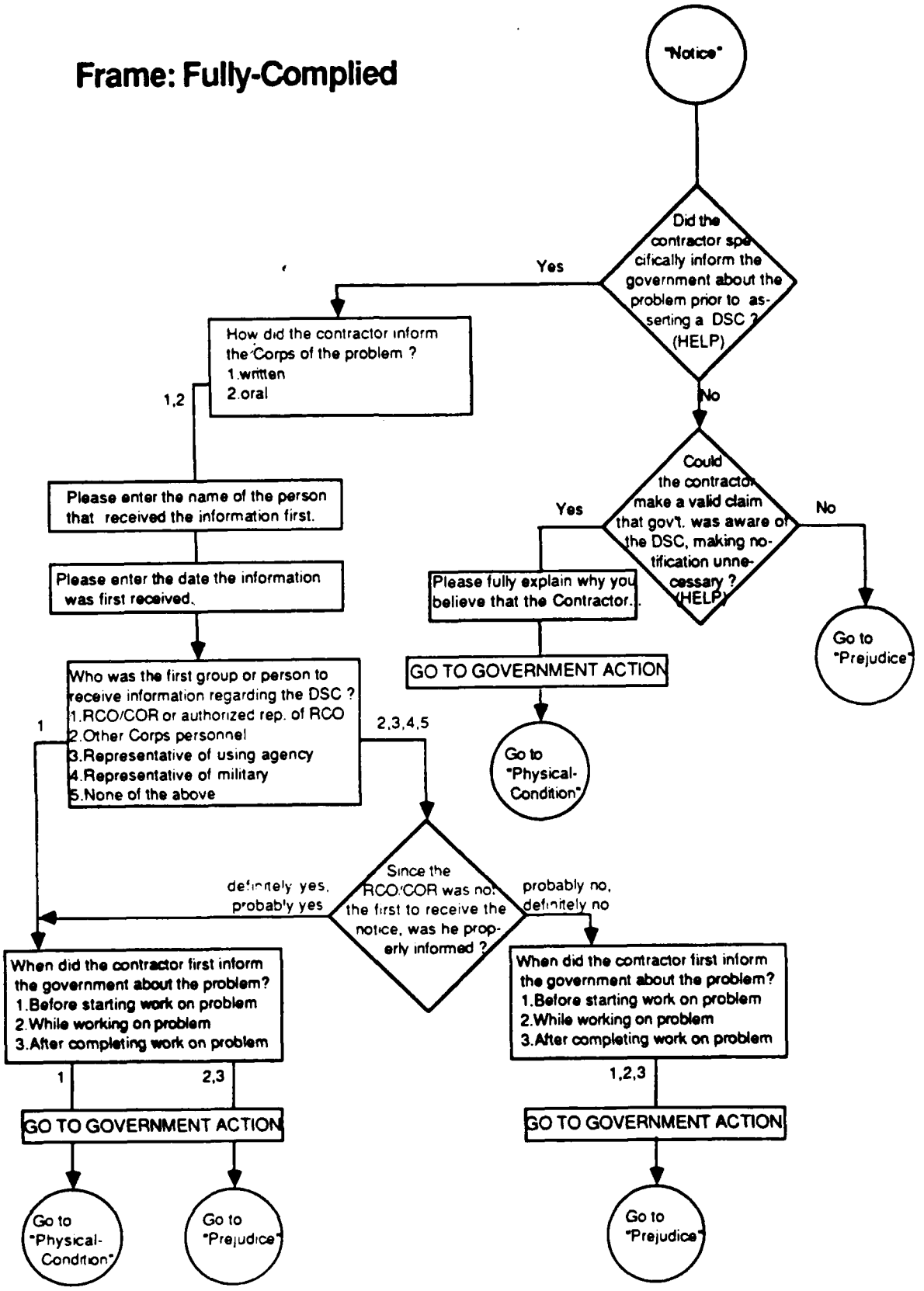


Figure A2. Fully-complied frame. Determines whether contractor fully complied with notice requirements.

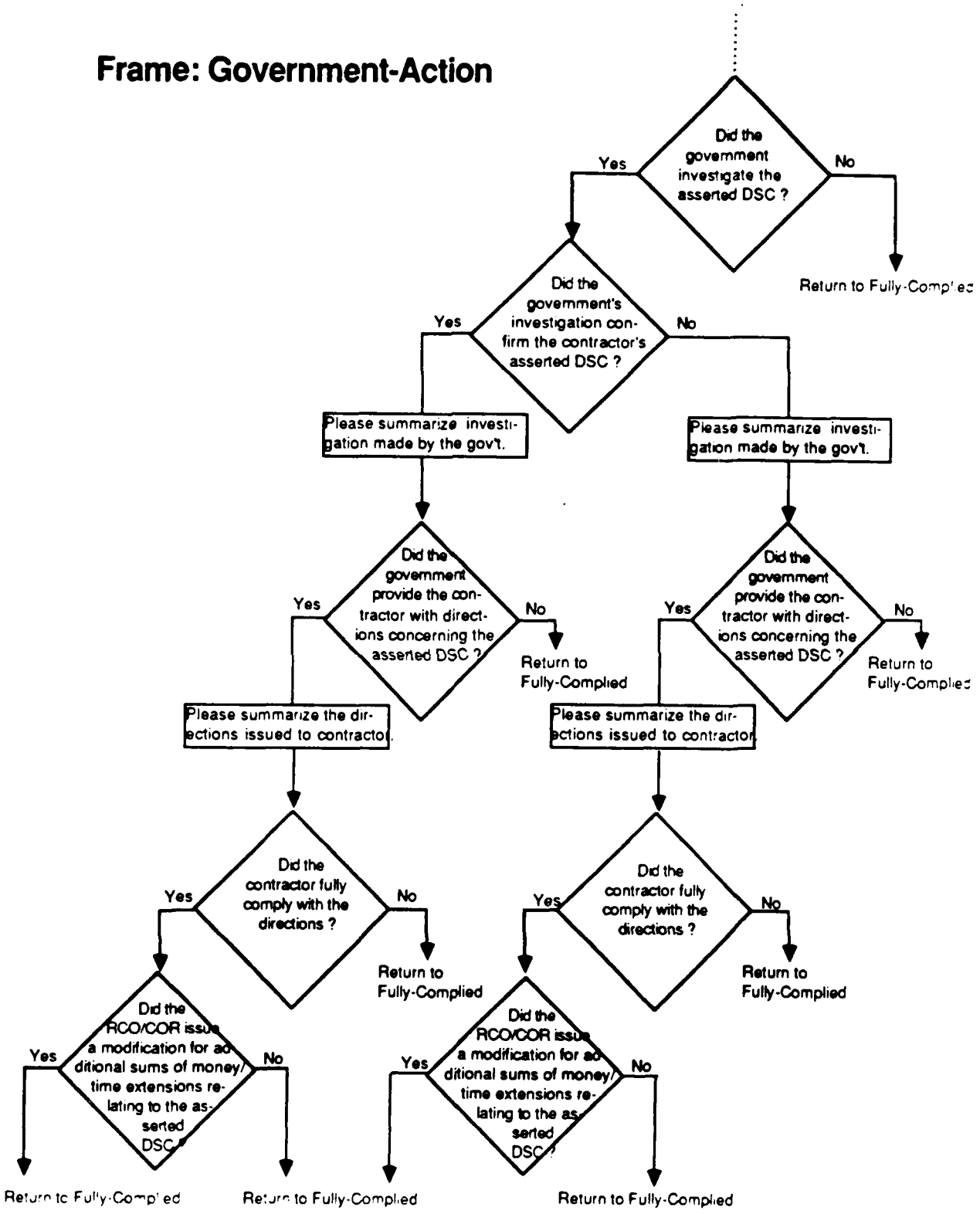


Figure A3. Government action frame. Helps user summarize and document investigations and contact with the contractor.

Frame: Prejudice

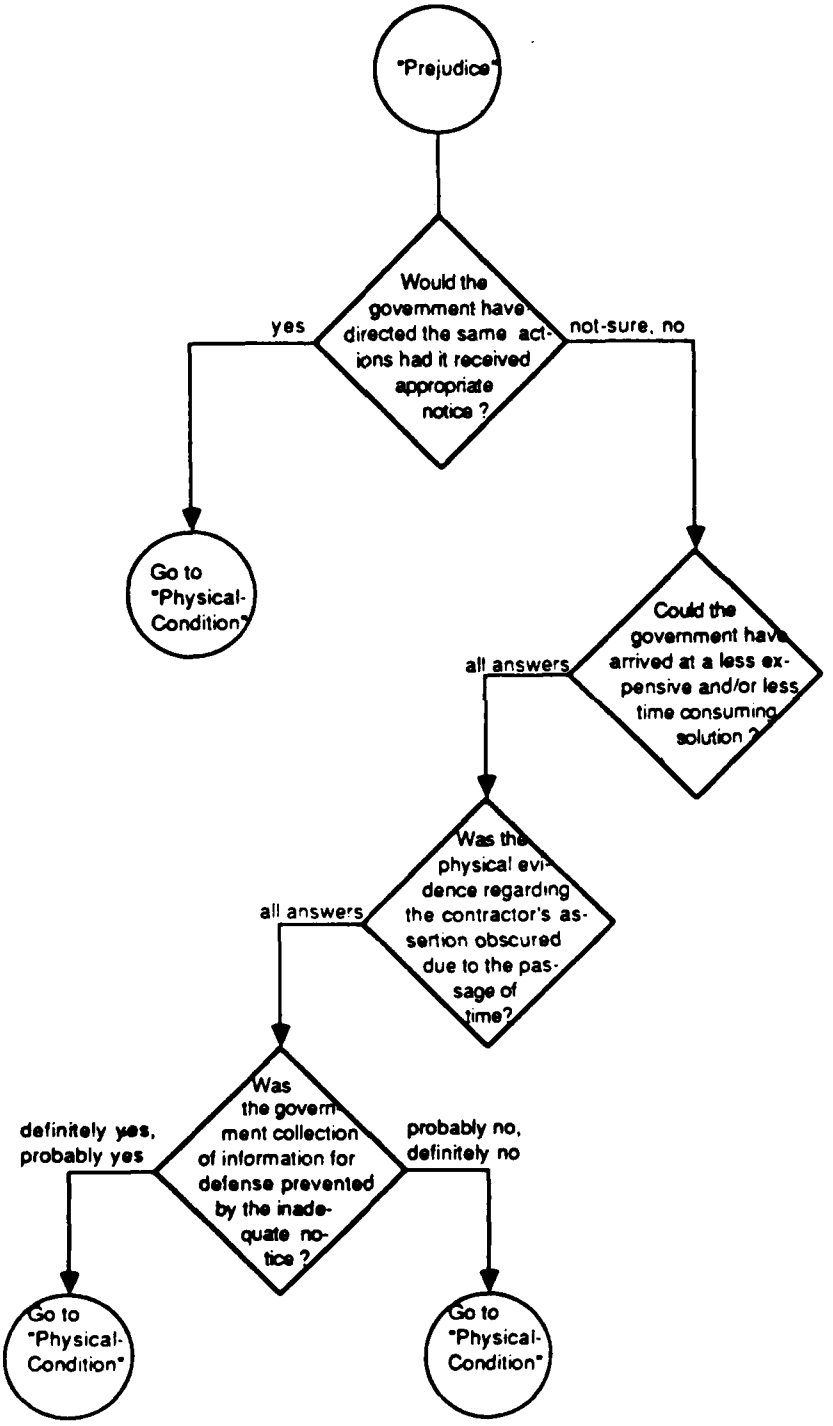


Figure A4. Prejudice frame. Determines and documents occurrence of prejudice to the Government.

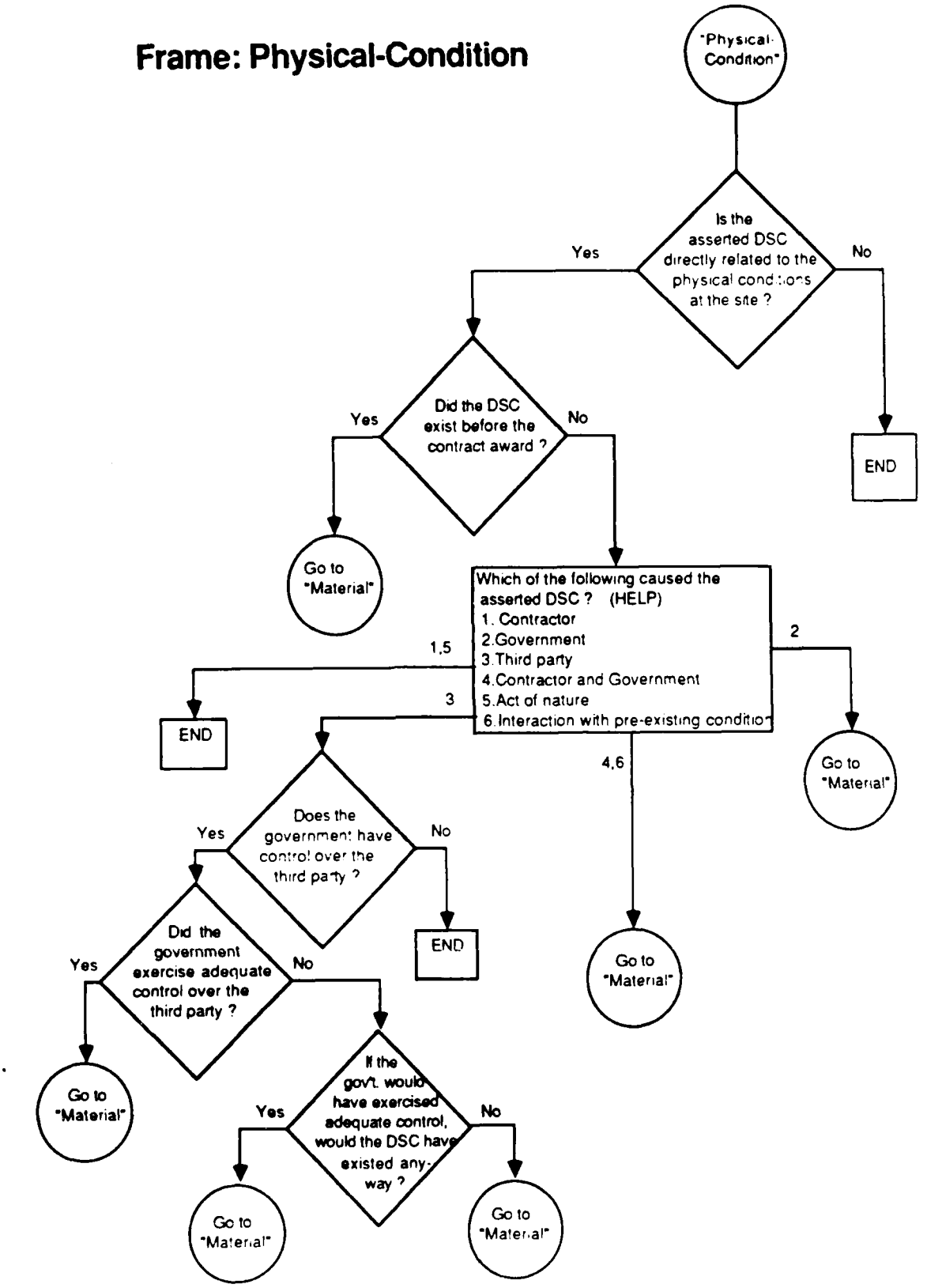


Figure A5. Physical condition frame. Determines the presence and nature of a physical DSC.

Frame: Material Difference

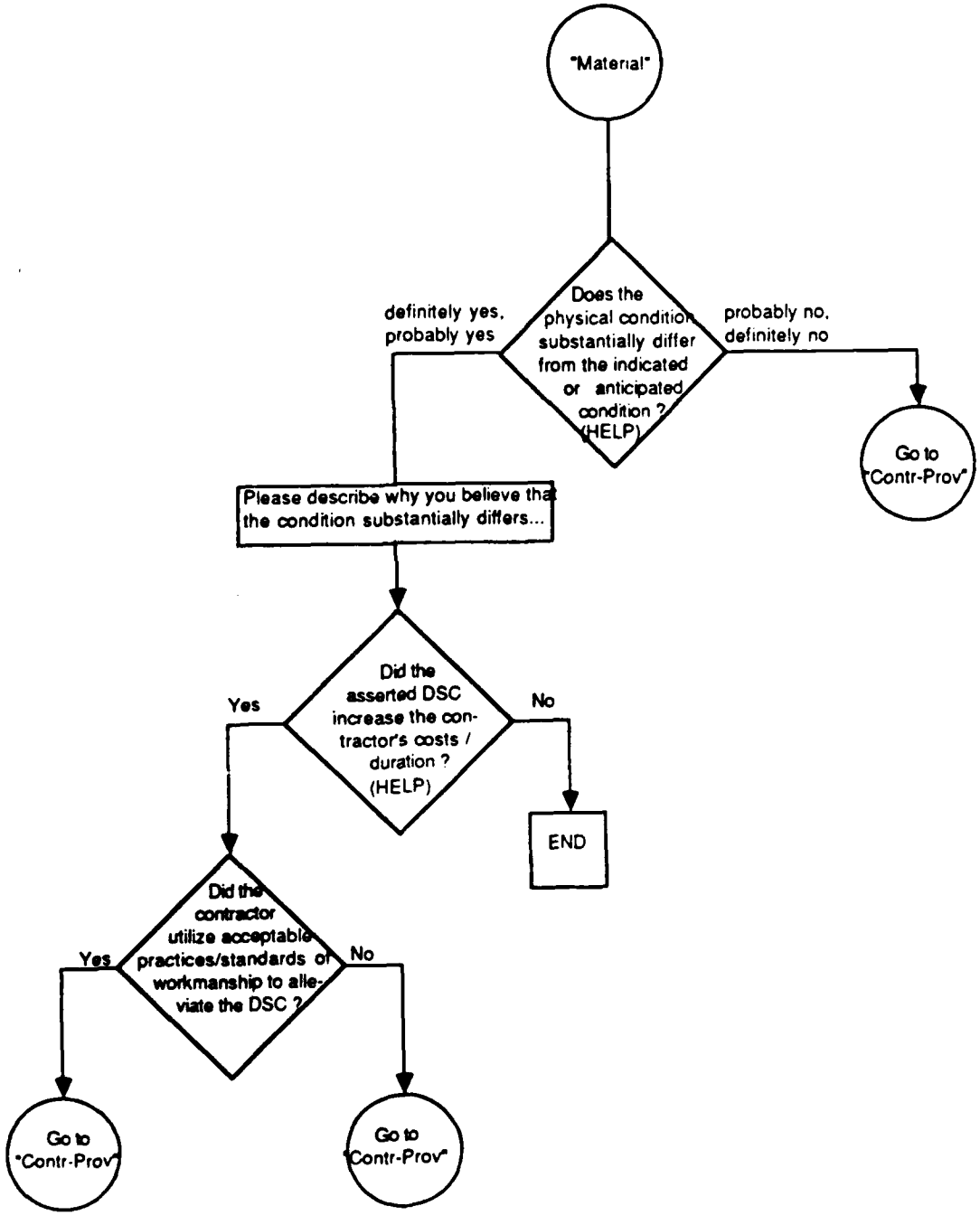


Figure A6. Material difference frame. Determines the "materiality" of the DSC.

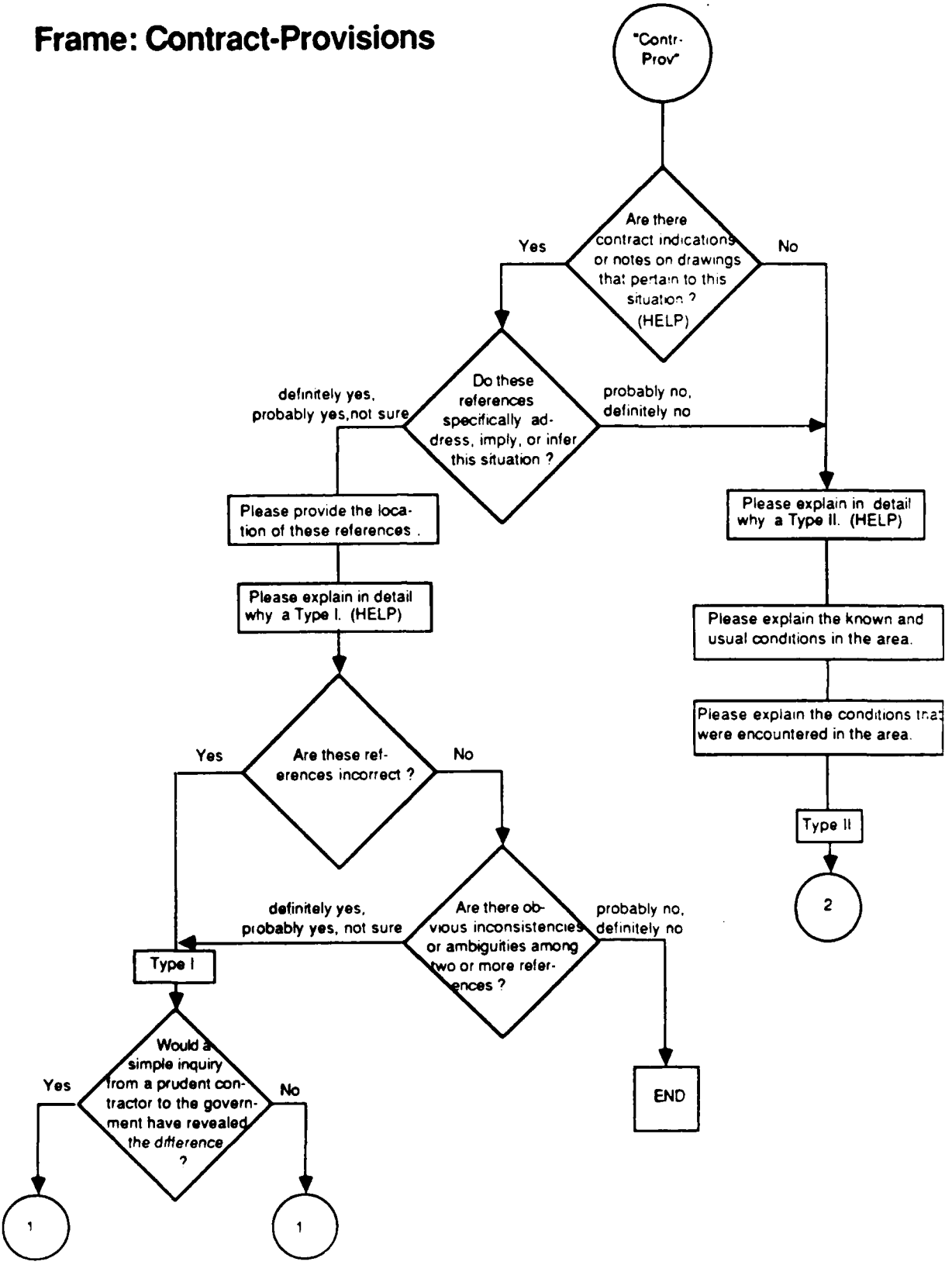


Figure A7. Contract provisions frame. Helps user examine the contract.

Frame: **Exculpatory Clause**

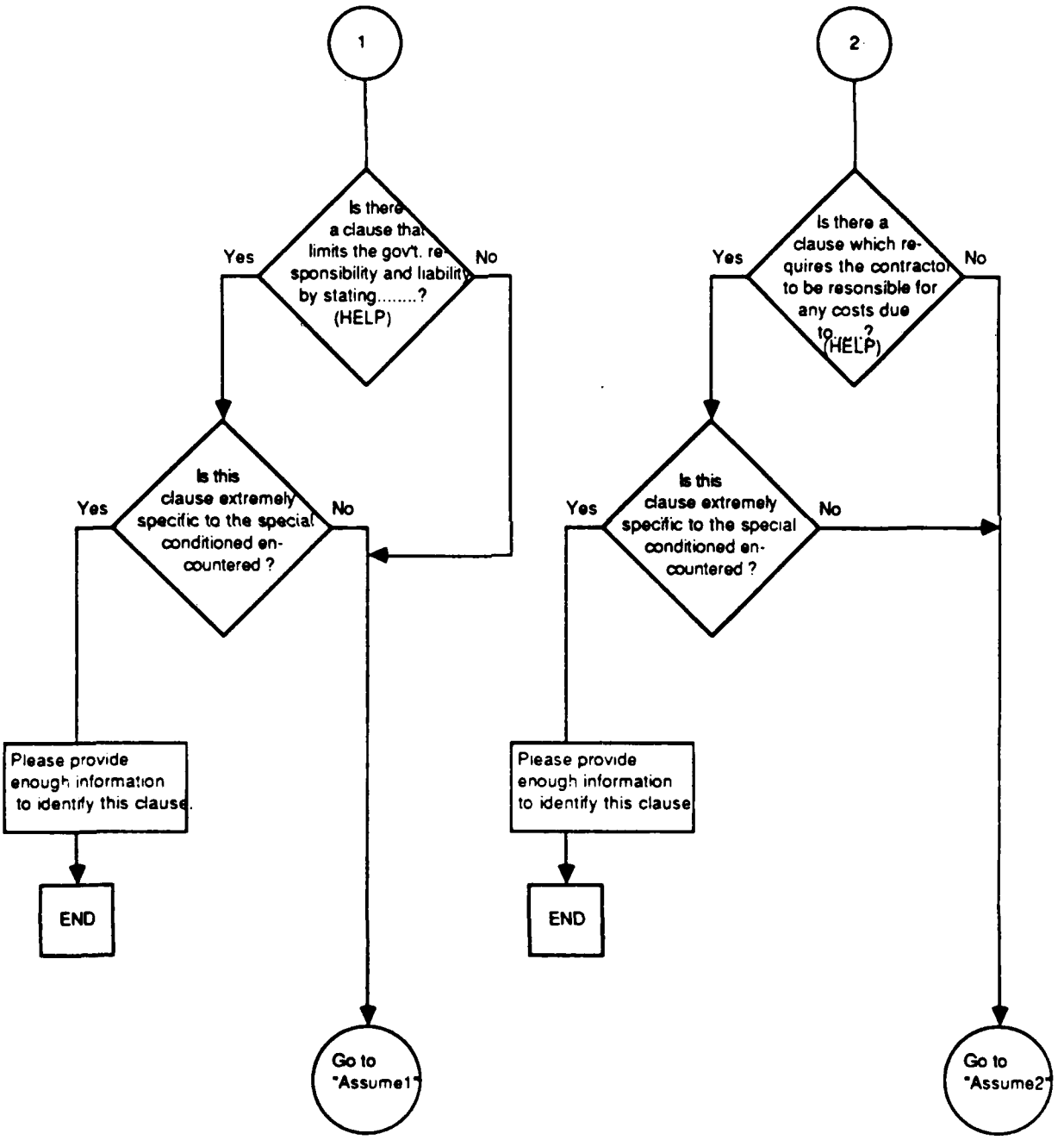


Figure A8. Exculpatory clause frame. Determines whether contract contains clauses limiting the Government's responsibility.

Frame: Contractor Expectations

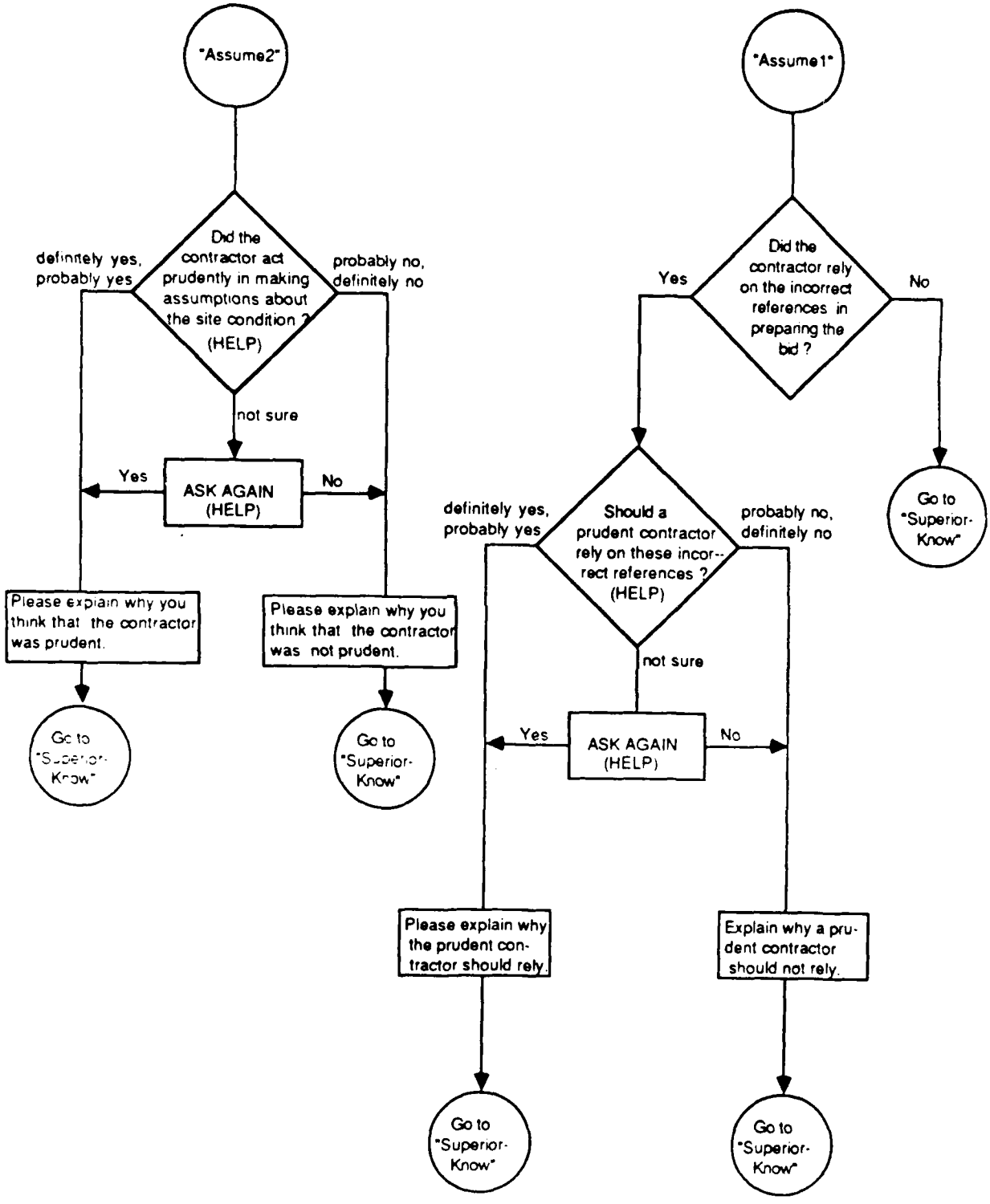


Figure A9. Contractor expectations frame. Helps user evaluate the contractor's assumptions.

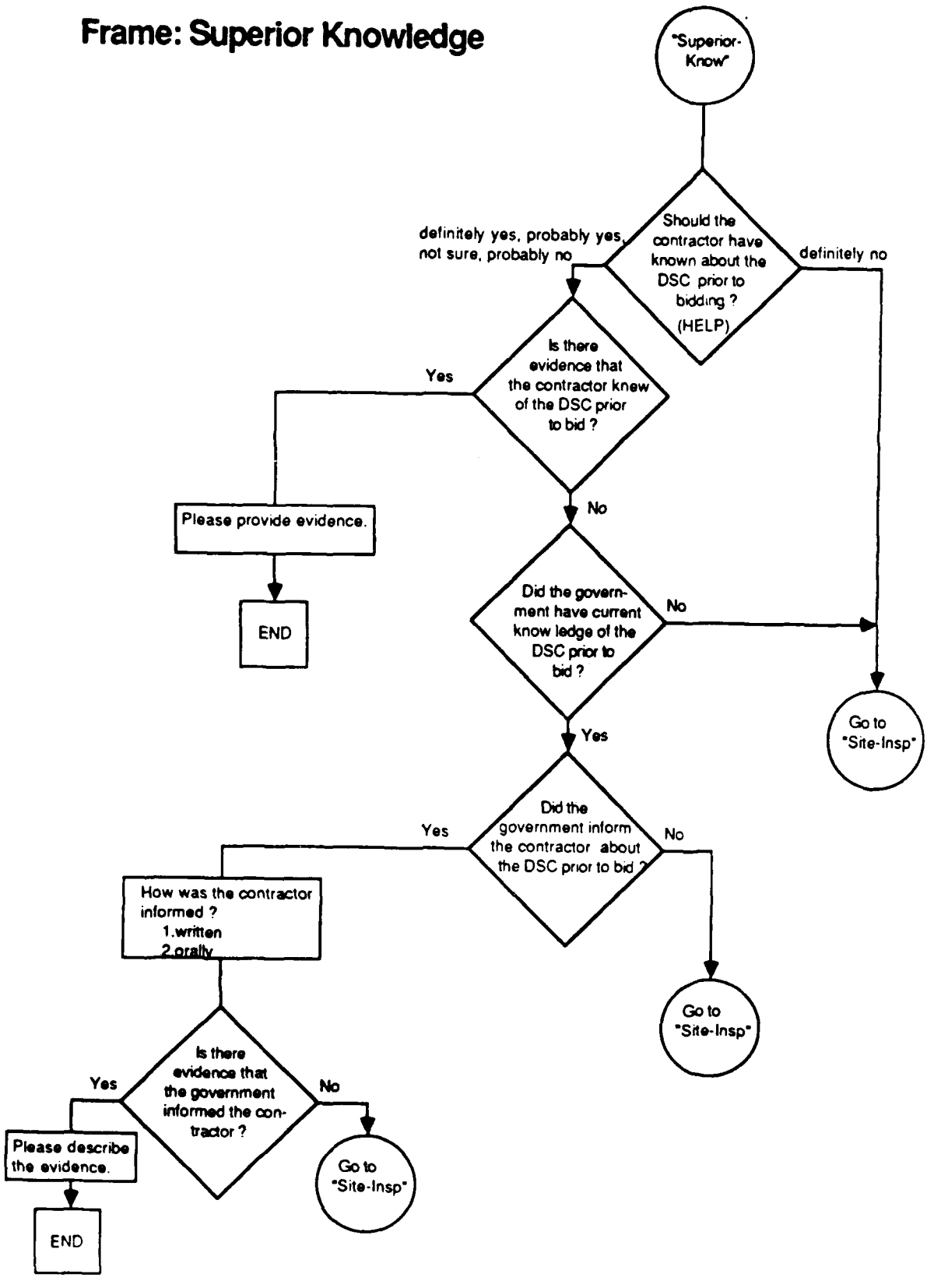


Figure A10. Superior knowledge frame. Determines whether the contractor knew about the DSC before bidding.

Frame: Site-Inspection

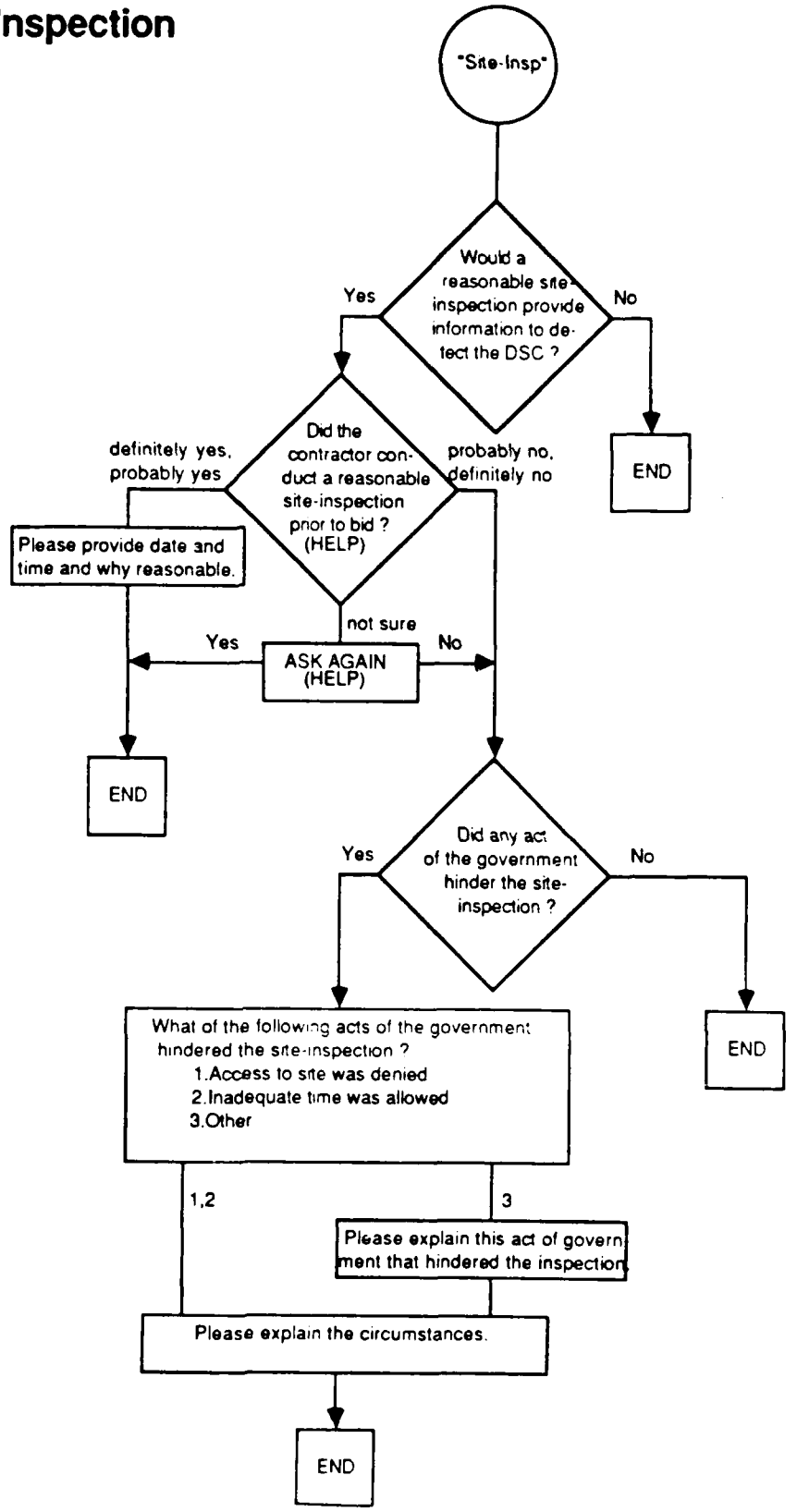


Figure A11. Site inspection frame. Determines circumstances surrounding site inspections.

APPENDIX B:

TEXT OF HELP SCREENS

The following sections contain the text of the CGS-DSC HELP screens. They are accessed by pressing the F1 key after a question appears, but before a response is entered. The screen appropriate to the question then appears. If there is no help screen for a question, a box with a message to that effect will appear when F1 is pressed.

The RETURN/ENTER key is used to return to the question.

FINAL PAYMENT:

In most cases, once the final payment for the contract has been accepted by the Contractor, it cannot make any additional claims. Final payment represents all the money owed to the Contractor for its work under the contract. Once the final payment is accepted and the Contractor has conceded that this is all the money owed it under the contract, no further claims can be made under this contract.

In one particular case where the Contractor's clerk inadvertently cashed final payment check, final payment appeared to be accepted. However, the court found that cashing the check did not constitute final payment. Here are some of the reasons the court made this decision.

(1) The Contractor rejected the final payment agreement by returning it to CO unsigned. (Note: The Contractor can not fall under the final payment exception if it signs final payment agreement.)

(2) Government's final payment check was mailed to the Contractor's office without any transmittal letter attached. Therefore, the Contractor's clerk did not know that the check was the final payment.

If you are not sure if the final payment was issued and accepted by the contractor, please find out before proceeding. As noted earlier, if you strongly believe that it has been accepted, the contractor will automatically waive any and all claims it has under the contract.

NOTICE:

Notice requirement has three important factors: (1) who, (2) when, and (3) how.

(1) Who: The Contractor notifies an authorized representative of the government that it encountered a DSC. An authorized representative is the Contracting Officer or an authorized representative of the Contracting Officer. The Contractor only needs to inform the government of the DSC, not how much money he will request as a result of the DSC claim. Therefore, once the Contractor can prove that an authorized representative saw the condition or should have been aware of the condition and notice has been inferred, the notification requirement has been met.

(2) When: It is important that the Contractor inform the Government of the DSC BEFORE the area is disturbed unless the Government has other means to verify the Contractor's assertion. On the other hand, if the Contractor has a hard time proving that some Government representative knew or should have known about the conditions, notification is even more critical. This is especially true if the condition has been disturbed. Once the condition has been disturbed the Government has little, if any, evidence to prove or disprove the Contractor's claim. If the Government finds that the condition did exist even though it has been disturbed, the next question that must be asked is whether the Government would have taken the same actions to overcome the DSC.

(3) How: Written or oral notification is acceptable.

WHEN NOTICE IS CONSIDERED WAIVED:

The general rule is that notice becomes an important issue when the Contractor fails to give notice BEFORE the condition is disturbed thereby causing prejudice, i.e., making it difficult for the government to determine the validity of the Contractor's DSC claim because the important facts relating to the DSC were destroyed or disturbed.

Additionally, before the Contractor can obtain the equitable adjustment requested, it must prove that the Government would have employed the same methods as the Contractor in overcoming the asserted DSC condition.

ACTS OF GOD:

The general rule is that the Government is not responsible for Acts of God (nonstatic condition) such as those caused by severe weather, unless this Act of God is intermixed with a proven (Type I DSC) and substantially differs from the "indications" in the contract, or an (Type II DSC) "unknown" or "unusual" condition which differs substantially from what is normally expected as inhering in the work. Thus, the Contractor must prove that it is (1) entitled to a DSC claim, and (2) an equitable adjustment for increased costs/duration caused by the intermixing of the weather and the proven Type I or Type II DSC before the Government is held responsible for the increased costs/duration caused by the DSC.

For example, if the imperviousness of the soil was explicitly or implicitly known given the "indications" in the contract, and severe weather (Act of God) intermixed with this condition causing a wet soil DSC, the Government is not responsible for the increased costs/duration incurred by the Contractor, because the contractor was aware of the imperviousness of the soil.

Under a Type II DSC condition, the Contractor's chances of entitlement are even more unlikely, since the Contractor has to prove that "unknown" or "unusual" DSC could not be anticipated given its knowledge and background in the area. Therefore, select the "Act of Nature" choice only when the Contractor cannot show that a Type I or Type II DSC exists.

ACTS OF 3RD PARTIES:

The general rule is that the Government will not be considered the cause of a DSC as the result of a third party's conduct, unless (1) Government was in control of the third

party, and (2) DSC would not exist if the Government had not failed in their responsibility to control the third party. For example, when a Government contractor builds a dam upstream from another Government contractor and the downstream contractor's work site becomes flooded as a result, the Government will be considered the cause of the DSC and responsible for all increased costs/duration incurred by the downstream contractor because the Government had control over the upstream contractor, and instructed the contractor to build a dam which resulted in a DSC flooding condition.

However, the Government will not be found to be the cause of the DSC when failure to control the third party would have resulted in a DSC anyway.

For example, if a third party, a city, builds a dam to maintain necessary water supply for the city, and the Government failed to obtain the necessary right-of-way permit for the upstream contractor to excavate an adjacent upstream riverbed, the Government will not be held as the cause of the DSC since the city would have built the dam, regardless of the permits, to provide essential water for the city.

MATERIAL DIFFERENCE:

Under a Type I DSC, the subsurface or latent (hidden) condition must differ materially (substantially) from that indicated in the contract. Under a Type II DSC, the condition encountered is unknown or unusual and differs materially from that generally recognized as inherent in the work.

Materiality can not be considered alone. The Contractor must prove that the condition encountered was materially different from "indicated" or the known or usual. Consequently, the Contractor did not anticipate this condition when it submitted its bid. The general rule is that if the Contractor's costs were increased because of this substantial difference, it will be given an equitable adjustment as long as its anticipations of what conditions should be encountered are adequate. Therefore, although "materiality" is necessary before a contractor can obtain an equitable adjustment, in many cases materiality is not an important issue since most contractors will not submit a DSC claim unless they encounter costly expenditures. Small claims can cost the contractor more to prosecute than a possible equitable adjustment award.

COST/DURATION:

In all cases, the Contractor's asserted increased cost must be DIRECTLY caused by the asserted, unanticipated, and material DSC. For example, if the Contractor argues that its increased cost was caused by the DSC such as hard shale which broke many drill bits, the Contractor must prove that this increased cost was directly related to the DSC, and not attributed to the work methods used by the Contractor. If the accepted standard practice is to use one drill bit to cut each 30 ft hole and the Government discovers that the Contractor used one drill bit to cut each 80 ft hole, then the Contractor is precluded from arguing that its increased cost was directly due to the alleged DSC.

IDENTIFYING CONTRACT INDICATIONS:

Under a Type I DSC, the Contractor must show first that there were indications in the contract and that it was justified to rely on these indications when it submitted its bid. There are some general rules governing how to identify which contract indications should be relied on.

The general rules are:

(1) Contract should be read as a whole. Clauses, both general and specific, should be given a reasonable interpretation before one clause is said to be superfluous.

(2) Specific clauses (specifications, plans, and technical clauses) override general (drawings, Site Inspection Clause. DSC Clause, and Physical Data Clause, etc.). In those instances where there appears to be a direct conflict between two or more clauses, and no reasonable interpretation can be read into both, the specific clauses will override general ones.

For example, the Contractor must show that it gave a reasonable meaning to the contract as a whole and that when there appeared to be a conflict, it relied on specific provisions in the contract and not some obscure notation in the drawing, visitor's map, or 500-page general guidance handbook.

TYPE I:

Clause One (Type I) DSC claim: The subsurface or latent (hidden) physical conditions at the site differ materially from those indicated in the contract. These indications or representations made by the government do not have to be specific; they may be implied or inferred from the contract documents.

Construction contracts are agreements between individuals. The Contractor agrees to do work and the Government agrees to give consideration (money) in exchange for the work. So when a Contractor submits his bid to construct a certain project, it is assumed that it has already decided exactly how much money will be necessary to complete the project. Additional money or equitable adjustments are not generally awarded unless the Contractor can prove it should not have had to anticipate the problem encountered and thus did not have to include the condition in its bid.

To overcome this presumption, under a Type I claim, the Contractor must prove that it anticipated certain conditions based on "indications" provided by the contract documents, and it justifiably relied on those indications. Once the Contractor proves that the indications in the contract were relied upon in placing the bid, the Government is obligated to provide evidence to reasonably support its contention that these indications do not materially differ from what should have been anticipated by the Contractor. If the Government does not meet this obligation, the Contractor will most likely win its DSC claim.

TYPE II:

Clause Two (Type 2) DSC claim: the Contractor has encountered an "unknown or unusual" physical condition at the site differing materially from those ordinarily encountered and generally recognized as inhering in the work.

In construction contracts, one person agrees to do work and the other person agrees to give consideration (money) in exchange for the work. So when a Contractor accepts a contract award, it is assumed that the Contractor agrees to do all the work in exchange for the awarded amount. It is assumed that the Contractor determined in advance exactly how much money would be necessary to complete the project. Therefore, equitable adjustments are not generally awarded unless the Contractor can prove he should not

have had to anticipate the problem encountered and thus did not have to include the DSC in his bid.

To overcome this presumption, under a Type II claim, the Contractor must prove that its anticipations about the conditions based on its own knowledge of the area or its past experience in this type of work were correct.

Then the Contractor must prove that it justifiably relied on its own assumptions and what it actually encountered were "unknown" or "unusual" given the type of work under the project. Since the Contractor can not point to a specific contract clause or drawing it relied upon, before it can obtain an equitable adjustment it is obligated to provide evidence to the Engineering Board of Contract Appeals (Eng BCA) that could reasonably lead the Board to agree that it made the right assumptions about the site (which later turned out to be incorrect). If the Contractor fails to meet this obligation, it will most likely lose the case.

EXCULPATORY CLAUSES:

Exculpatory clauses: Government (drafter) adds this clause hoping to exculpate (remove from responsibility) the Government from all potential claims, while simultaneously placing all responsibility upon the Contractor.

General rule: The Government can not use a general exculpatory clause as a means to shield itself from all potential lawsuits.

Exceptions: If the exculpatory clause appears to be written especially for the particular potential problem condition, then the Contractor's claim will most likely be denied.

For example, one clause provided in part, "...Contractor is responsible for all losses of material and equipment due to severe weather conditions... ." The contract was for construction of a storm wall off the Pacific Ocean. Insertion of this clause shows that the Government made it very clear it would not be responsible for any losses on the job due to weather. Unfortunately, a severe storm washed away half of the storm wall and Contractor's claim was denied for two reasons. First, the exculpatory clause was specifically written to warn the Contractor that it was responsible for any damage caused by weather while constructing the storm wall. Second, it is reasonable to assume that the Contractor should anticipate damage caused by weather while constructing a storm wall.

PRUDENT CONTRACTOR:

Prudent Contractor: If most contractors with similar experience/knowledge, and under the same circumstances, would agree with the contractor in question, the contractor is said to be a prudent one.

Prudent Contractor would:

(1) Use his past experience and knowledge as a basis for all his judgments and assumptions.

(2) Act as most of his peers would, given the same set of circumstances.

(3) Submit a contract bid based on fair reading of representations indicated in Government contract and on adequate site inspection.

(4) Make assumptions using his past experience and knowledge when conducting a site inspection.

(5) Make assumptions using his past experience and knowledge when reading the contract drawings and specifications, and therefore, would not rely on obvious flaws noted in the contract.

APPENDIX C:

CASES DATABASE

This appendix contains descriptions of the cases used in the CGS-DSC data base. These cases were retrieved from the Lexis System and appear here in alphabetial order, with each case beginning on a new page. They can be categorized by the portion of the DSC clause used to decide the case, as follows.

Cases Contractor Was Not Entitled

Prejudice
- C. H. Leavell Case
- Schnip Case

Acts of Nature
- Dryer Case
- Massman Case
- Turnkey Case
- Welch Case

Unreasonable Contractor
- C. H. Leavell Case
- Dravo Case
- Massman Case
- Pacific-Parker Case

Unreasonable Site-Inspection
- C. H. Leavell Case
- Pacific-Parker Case

Unacceptable Practice
- Pacific-Parker Case

No Substantial Difference
- Portable Rock Case

Contract Provision
- Portable Rock Case
- Turnkey Case
- Welch Case

Cases Contractor Was Entitled

Government Action
- Foster Case
- J. J. Welcome Case
- Massman Case

Prudent Contractor - Type II
- Groves-Granite Case
- Liles Case

No Prejudice
- Perini Case

Contract Provision
- General Casualty Case
- Granite-Groves Case
- Liles Case
- Morrison Case
- Ray Case
- Robertson Case
- Select Case

Waiver of Notice
- American Case

The following abbreviations are used to indicate the sources of the citations.

ASBCA:	Armed Services Board of Contract Appeals
Eng BCA:	Engineering Board of Contract Appeals
PSBCA:	Postal Services Board of Contract Appeals
Ct. Cl.:	Court of Claims
GSBCA:	General Services Board of Contract Appeal

C. H. Leavell Case

Summary:

Contractor entered into a contract to construct five buildings at Lackland Air Force Base, Texas for $15,000,000. Contractor DSC equitable adjustment was denied since it must assume the risk of its own unreasonable interpretations of the contract indications when a simple inquiry to the Government could have clarified the borings that were inconsistent or unclear. Contract's borings indicated that subsurface soil was practically impervious, and some of drawing's symbols were unclear. Contractor's assumption that unclear symbols represented impervious soils and that water would therefore not enter holes after drilling was unreasonable.

DSC Claim:

The contract indicated that soil would be relatively impervious, but as a result of pervious nature of the soil encountered, extensive casing was required for many of the drilled piers.

Contract Provisions:

"...Contractor was responsible for satisfying itself as to the...uncertainties of weather, river stages, tides or similar physical conditions at the site"...and to the "...character, quality and quantity of surface and subsurface materials to be encountered... ."

Rationale For Denying Equitable Adjustment:

(1) Unreasonable site inspection:

The Contractor failed to make inquiries of the Government or of the prior contractor working on the site during site inspection and also failed to make proper evaluation of the visible and expectable conditions. The Contractor's own expert witness testified that a prudent contractor would not have relied on visual site inspection or notes on contract relating to "fault and joint systems."

(2) Contractor's interpretation of contract not reasonable:

The Contractor failed to examine the available logs of drill holes in the vicinity of the slope or follow up a note that "fault and joint system known to exist in area are not represented on this drawing... ." The Contractor can not rely on inconsistent contract indications of the subsurface when it was noted on the contract that more detailed tests were available. The Government is not obligated to volunteer such facts which could have reasonably have been discovered though the Contractor's own site investigation and pursuit of leads given by the contract papers.

(3) Timely notice/prejudice:

Since the Contractor did not make the DSC claim until 1 year after project completion, it is required to provide more persuasive evidence with respect to the alleged changed conditions (i.e., Government was prejudiced by failure to meet notice requirements).

Citation: *C. H. Leavall & Company v. Eng BCA.*, 3492 75-2 BCA (1975)

Dravo Case

Summary:

Contractor entered into a contract with Washington Area Transit Authority for construction of 5,300 ft of single track earth tunnel for Archives Metro Station in Washington, D.C. Contractor was denied Type I DSC claim since it could not prove that it was correct to rely on the erroneous shear strength data in final soils report or that its increased costs were due to Type I DSC and not caused by poorly designed tunneling shield.

DSC Claim:

The Contractor stated it relied on preaward soils data when preparing its bid and expected to advance its tunneling shield 30 ft/day. However, when it encountered one stratum (called P-3) which was two to three times harder than indicated in the soils report, the shield broke down, reducing the rate of tunneling from 30 ft/day to less than 10 ft/day at some locations. The Contractor seeks an equitable adjustment of $2,222,523 and time extension of 63 calendar days.

Contract Provisions:

Contained 2.11 (a) Physical Data Clause, which identified the final soils report and said that certain other reports were available. The clause also stated that the report was in no way to be considered "...part of the contract." (Note: Government usually adds this or similar phrase "...not part of Contract..." so that the Contractor can not claim a Type I DSC, which states that the "...indications in the contract are materially different... ."

Government counsel, on the other hand, held that the condition encountered by the Contractor should have been anticipated after proper reading of the soils report. They held that the shield broke down at the P-3 stratum as result of inadequate shield design, not DSC. Moreover, the Contractor did not rely on the soils data when it placed its bid and estimated a 30 ft/day tunneling rate. Thus, the Contractor did not rely to its detriment on the soils data.

Rationale For Denying Type I DSC Claim:

(1) Contractor must rely on incorrect indications in the contract:

The Contractor must prove it used the shear strength data report in preparing its bid. The Contractor's estimators never testified in front of the Board, and the Contractor's own testimony did not persuade Board to believe the estimators relied on parts of the soils report which stated the strength of the P-3 material was 4 to 6 kilo-pounds per square foot (k.s.f) instead of 12 to 18 k.s.f encountered.

(2) Contractor must be misled by incorrect indications in contract:

The Contractor must be misled by this inaccuracy and there was no evidence that the inaccurate P-3 data was used in calculating crew size, tunneling rate, or design of the shield.

(3) Physical data report:

The Physical Data Clause which informed bidders of available reports and contained erroneous information should not have been relied upon since the clause states that the report was not part of the contract. Incorrect information in the Physical Data Clause regarding strength of the P-3 material is not an "indication" of the contract and should therefore not be relied upon over the actual representation made by the contract. Bidders should not have taken into account the so called "available" information referred to in the clause.

(4) Increased cost/duration must be directly caused by DSC:

Delays caused by the shield would not have been any different if the soils report had listed the strength of the P-3 as 12 to 18 k.s.f., since no one testified that the shield would have been designed differently had the incorrect value been relied upon. The Government's experts testified that the design of the shield was not adequate.

Citation: *Dravo Corporation v. Eng BCA*, 3901, 80-2 BCA, (1980)

Dryer Case

Summary:

Contractor entered into a unit price contract to improve the reach of the Saline and Middle Fork River with stationing from 512+35.17 to 1116+00. Contractor was denied Type I DSC equitable adjustment because buildup of silt is not a subsurface or latent (hidden) condition and because the Government is not generally responsible for acts of third parties unless the Government is found to be at fault. Type II DSC was denied since siltation caused by flooding existed after the contract was awarded, and because flooding is considered an Act of God and not recoverable under the DSC Clause. However, the Contractor was given an equitable adjustment for siltation caused by floods which damaged the permanent work under the Damage to Work Cause.

DSC Claim:

The Government awarded the Contractor a contract for this job in January 1972. The contractor began work on the project in a conscientious and professional manner. Unfortunately, the Contractor encountered several difficulties that caused problems in the completion of the project. One major setback was a 10-week period of rain that caused severe flooding. The flooding caused 3 to 4 ft of silt to settle in certain areas that the Contractor had previously excavated. The Contractor argued that this condition was a DSC and that it was entitled to additional payment for the silt removal.

The Contractor further complained of another problem which it argues is also a DSC. The Saline River as a major source of water for Harrisburg, Illinois. During the summer months the water level often dropped and the city dammed the river to build up its supply of water and then later removed the temporary dam. The city did so in the fall of 1974. Unfortunately this had a harmful effect upon the Contractor's work. First, the water level rose upstream from the dam, which prevented further work until the water receded. After the city removed the temporary dam, a deposit of silt and earth remained in the river which the Contractor had previously excavated. The condition of the riverbed was muddy and wet, making it hard for the Contractor to work. The Contractor demanded an equitable adjustment for the additional expense of removing this additional silt and earth.

The Government argued that the Contractor knew of the silt problem and that it was stated in the contract. The Government further argued that it was not responsible for the acts of third parties or Acts of God. Therefore, the Contractor must bear the burden of the extra costs incurred as a result of the flooding and the temporary dam.

Site Inspection:

The Contractor conducted a prudent site inspection. It was not readily observed that siltation would be a problem as a result of spring flooding or temporary dams.

Rationale for the Denial of Type I and Type II DSC:

(1) Type I DSC must be either subsurface or latent:

The DSC Clause Type I requires that the condition be subsurface or latent; silt is neither.

(2) Contractor should anticipate indications in contract:

The problem with the silt condition was indicated in the contract, which is why the Contractor agreed to excavate below the plan grade.

(3) Prudent Site Inspection Clause:

The Contractor is responsible for subsurface, latent, unknown, or unusual that are "...readily observable."

(4) Act of God or third party adverse condition caused after the contract award:

Under the DSC Clause, the alleged condition must have existed at the time the contract was awarded. Siltation caused by flooding (Act of God) and dams (third party) occurred after the contract was awarded and the Government was not at fault. The Government is only responsible for Acts of God when the Act of God intermixed with a Type I or Type II DSC. Here, the contract indicated that siltation was a problem, so the condition does not come under the Type I category, or under the Type II since siltation was known and usual. Similarly, the Government is not responsible for acts of a third party unless it was partly at fault, i.e., acted unreasonably in overseeing the third party.

If the Government has the power to prevent a third party from activities which might reasonably be expected to create adverse site conditions and fails to do so, it becomes responsible for the increased cost of the Contractor's performance.

In the present case, the Government did not cause the DSC by failing to obtain the right-of-way for the Contractor. The city would have constructed temporary dams with or without permits, since it was necessary for them to supply water to the area.

Citation: *Dyer & Dyer v. Eng BCA*, 3999, 80-2 (1980)

Foster Case

Summary:

The Contractor entered into a contract to construct a bridge over the Terrabe River in Costa Rica and to construct a 56-mi. stretch of road of which the bridge was a part for $9,607,185. The Contractor was entitled to an equitable adjustment for encountering a Type I DSC when contract logs indicated that it could perform the excavation in the dry and was forced to perform excavation in the wet. A prudent site inspection would not have detected that work had to be performed in the wet.

DSC Claim:

The Contractor encountered excessive water and unstable soils at piers 4, 5, and 6, which required abandonment of excavation in the dry. Excavation was completed in the wet due to excessive amount of water and material running into the holes.

Contract Provisions:

The contract indicated that all concrete for bridge piers was to be placed in the dry without a seal or seal class concrete. Contract logs were conflicting, but overall they indicated that the subsurface conditions would be firm and stable, with a 6 ton/sq ft bearing capacity at the footings, and relatively impervious or resistant to flow of water. This would allow the cofferdam to be dewatered by pumping, thereby permitting excavation in the dry.

Site Inspection:

The Government argued that a prudent contractor would have noticed that the nature of the subsurface in an alluvial riverbed during a minimum site inspection and contract logs should have been read with this in mind. Therefore, the Contractor should have anticipated the DSC. However, the Government expert testified that he would not expect a contractor to be experienced in soil mechanics or geology but to have access to people with such skills who would have concluded that the alluvial condition was fairly obvious.

Government Action:

Modifications were issued, and the piers were redesigned because of the unstable foundation condition and excessive amount of water.

Rationale for Awarding Equitable Adjustment:

(1) Contract indications can be inferred to meet DSC Type I category:

Indications in the contract do not have to be specific; they can be implied or inferred. Since the contract indicated that all concrete was to be placed in the dry, it was reasonable for the contractor to assume that the subsurface would be such as would enable him to excavate in the dry. Moreover no mention was made in the contract for use of seals or seal class concrete, which are necessary to excavate in the wet.

(2) Site Inspection Clause:

The purpose of this clause is to prevent bidders from including a contingency element to cover risks of encountering adverse subsurface conditions. Bidders are thereby given information on which they may rely in making their bids and are promised that if subsurface conditions turn out to be materially different than those indicated in the logs, they will be given an equitable adjustment. Site inspection requiring bidders to decide for themselves about what subsurface conditions they will encounter departs from the underlying policy of the DSC clause.

The Court held that the Contractor's "duty to make an inspection of the site does not negate the Changed Conditions Clause by putting the contractor at peril to discover hidden subsurface condition or those beyond the limits of an inspection appropriate to the time available."

The Court further held that the Contractor conducted a reasonable site inspection because the Government expert testified that a background in soil mechanics was necessary to determine the alluvial condition during site inspection, establishing the fact that the DSC condition was not readily observable and could not be anticipated by the contractor.

(3) General versus specific clauses:

A general clause in a 500-page book (attached to Contract) states that "...if excavation in wet is necessary contractor should proceed..." does not constitute an "indication" since it is part of a general clause, and log borings are specific and overriding.

Citation: *Foster Construction C.A v. United States*, 435 F.2d 873 (1970), 193 Ct. Cl. 587

General Casualty Case

Summary:

Contractor entered into a unit bid contract to construct grading, draining, paving and fencing of Zanesville Airport. Contract price was $0.25 per cubic yard for grading and $1.65 for rock excavation. Project was to be completed in 150 days. Contractor was awarded an equitable adjustment for DSC 216,000 cu yd of hard shale which was found not to fall under the contract indications of Rock Excavation ($1.65/cu yd) or Grading ($0.25/cu yd). Contractor's second DSC claim for additional 418,851 cu yd of hard shale encountered was denied since it was found that contractor used grading equipment to handle the shale condition thus did not incur increased costs for a second DSC claim.

DSC Claim:

The Contractor claimed that a Type I subsurface condition existed which differed materially from that shown by drawings, specifications, and borings and which could not been anticipated from a study of the drawings. Government experts had additional borings conducted when the contract was almost completed. Three of the 17 borings were within the area where the Contractor stated he encountered shale and rock. Borings showed shale and limestone. Two of the three holes were hard enough to get core samples with a rotary core drill with diamond tools for cutting. On the third hole, a sample tube was driven in with No. 225 hammer using 3-in. strokes.

The Contractor encountered two differing site conditions. The first condition encountered was 216,755 cu yd of laminated hard shale which was more difficult to remove than grading. It could not be removed in any efficient manner without a 1-yd shovel supplementing the 3/4-yd shovel, and by being loosened in some areas with a single tooth rooter powered by two tractors. The hard shale also did not compact well and required more load to the fills, increasing costs. The second DSC was for 418,851 cu yd of hard shale.

Contract Provision:

The borings shown were made by means of a hand auger at intervals of 500 ft along the center line of the runways. All 35 borings were made on each runway and connected with horizontal lines designated A, B, and C. These borings did not show hard shale. Only four samples were submitted to the Flood Soils Laboratory for analysis. This fact was unknown to the Contractor. The Government did not deliberately misrepresent the materials it thought would be encountered or hold back any information it had from Contractor. Contract drawings were not entirely correct. The contract provided that "Rock Excavation" required continuous blasting and paid at the rate of $1.65 per cubic yard and grading at the rate of $0.25 per cubic yard.

Site Inspection:

A site inspection could not have detected the DSC.

Notice:

The Contractor notified the Resident Engineer orally and 30 days later by letter. The Contracting Officer (CO) denied the rock claim on the basis that the material was being rooted and was therefore grading under the contract.

Rationale Used in Deciding Case:

(1) Contractor favorable testimony:

Evidence proved (equipment employed by Contractor) that first DSC Type I Claim of 216,755 cu yd of excavation encountered was not "Rock Excavation" nor was it "Grading" within the terms of the contract.

(2) Court imposed fair price adjustment:

Although the Contract only provided for $0.25/cu yd for "Grading" and $1.65 for "Rock Excavation", court found a fair and reasonable price for hard shale excavation was $0.65/cu yd.

The Contractor's second DSC claim of 418,851 cu yd of hard shale was rejected because the Contractor admitted to using grading equipment; a rotter with three teeth powered by a crawler-type tractor having 1100 horsepower and pans. No blasting was necessary.

Citation: *General Casualty Company of America v. United States*, 127 F.Supp. 805 (amend. 1955) cert. denied.

Granite-Groves Case (Type I)

Summary:

Contractor entered into a contract to build the Stadium Armory station and tunnels for the Washington Metropolitan Area subway system for $27,436,012. The dispute arose under the "support of excavation" portion of the work which involved installing soldier piles (80-ft steel H beams) and placing wooden planking between soldier piles. Soldier piles were installed in drilled holes rather than driven into the ground. Contractor was awarded an equitable adjustment for the DSC Type I encountered because it was reasonable to rely on quotes made by subcontractor when subcontractor's quote was based on studying boring logs in IFB (invitation for bid). Contractor also anticipated coarse sand or gravel rather than boulders when the physical data clause and boring logs in the work site did not directly note boulders. Several boring logs of holes outside the site directly noted boulders.

DSC Claim:

The Contractor encountered boulders in the T-3 stratum and seeks an equitable adjustment for $233,167 and 31 calendar days. Sixty-five percent of the holes, (one out of every three) had boulders, where it was reasonable to expect at most 5 percent (one out of 20) would contain boulders.

Contract Provisions:

A Physical Data Clause provided in part, "Authority will not be responsible for the completeness or accuracy thereof nor for any deductions, interpretations or conclusions drawn..." and noted that reports #4 and #18 were available. Report #4 referred to independent logs of borings made for this project. Report #18 was not listed in case.

Log borings (considered part of contract unlike the Physical Data Clause) indicated in part "...Compact to very compact brown and red-brown fine to coarse sand with some silt and numerous boulders. T-3 is very continuous throughout the study area except where it has been removed by erosion in the old drainage channels....Sampler penetration resistance generally is in the range of 40 to 60 blows/ft but in coarse gravelly lenses or where boulders are encountered penetration resistance increased to very high values. Boulders were shown as particularly numerous in the area outside of the Contractor's work site. Report 18 provided in part...compact to very compact brown...and variable amounts of cobbles and boulders."

Interpretation of Contract Borings:

The Contractor and subcontractor both are experienced estimators. After reading the borings both concluded that the boulders noted in the borings were outside of the work site. The prime contractor concluded that it could expect an average rate of production of three holes per rig per day using two drilling rigs.

Government Expert's Interpretation of Contract:

Contract borings indicate that the Contractor should have anticipated at least 80 percent boulders in the holes. He said that the high blow counts amounted to boulders or nesting of cobbles, and that the Contractor should have reasonably anticipated that boulders would be quite frequent in the T-3 stratum.

Rationale Used To Award Contractor Equitable Adjustment:

(1) Contractor must rely on indications in contract when submitting bids:

Contractor relied on contract borings; it does not matter if the physical data report was also relied upon since both based their bids on the indications in the contract.

(2) Interpretations of contract log borings must be reasonable:

Both prime and subcontractor were very experienced in reading borings and working in this area, their interpretation of the contract log borings were reasonable since the varying blow counts could indicate boulders or dense layers of gravel or sand. Boulders were only specifically noted in the contract drawings in areas outside of the work site.

(3) Materiality:

Although there is conflicting testimony on exactly how many boulders the contractor encountered (between 35 and 200), the Board concluded that the Contractor encountered 88 of the 380 holes drilled in the fan shaft of Stadium Armory Stations. Thus, the conditions encountered (65 percent boulders when the contract indicated 5 percent), was materially different than should have been anticipated.

Citation: *Granite-Groves v. Eng BCA* 3977 & 4033, 79-2 (1979) (separated for convenience)

Groves-Granite Case (Type II)

Note: This Type II DSC claim for abandoned pilings is part of the original case of Granite-Groves but was separated for convenience.

Summary:

Subcontractor was awarded a DSC equitable adjustment for $26,000 when he found abandoned pilings in the work site which had been left by previous contractor; these forced Contractor to reposition one of his soldier pile holes when a site inspection revealed another contractor had worked on a sewer. Contract did not indicate that pilings would be left or warn of such pilings. An experienced Contractor would not anticipate such pilings.

DSC Claim:

The Contractor seeks Type II DSC equitable adjustment for $26,000 for cost relating to previous contractor's (Kiewit & Sons) abandoned pilings. Kiewit abandoned pilings in contractor's line of soldier pile holes. These abandoned pilings caused the Contractor to move one of its pile holes and redesign part of its support of excavation system. Kiewit had been asked to fill excavation in part of the current Contractor's work site with granular material. Kiewit did, and the Contractor experienced cave-ins in the fill material placed by Kiewit. The Government argued that it was industry/trade custom to abandon pilings and therefore should have been anticipated by the Contractor.

Rationale for Awarding Equitable Adjustment Type II DSC:

(1) Custom/trade in construction industry:

It was not found to be customary in the construction trade to abandon pilings, thus Contractor could not anticipate such condition.

Citation: *Granite-Groves v. Eng BCA*, 3977 & 4033, 79-2 (1979) (Separated For Convenience)

J. J. Welcome Case

Summary:

Contractor entered into a contract to construct a sewage collection system including lift stations, force mains, and sewage lagoon on the Makah Indian Reservation for $450,000. Contractor's DSC Type I was awarded despite Government's argument that Contractor failed to give timely notice, because the Government issued a modification relating to the DSC which implied the Government was aware of the DSC encountered.

DSC Claim:

Seventy-five percent of the soil profile of the lagoon site was correct as noted, made of humus, clay and sand. However, 25 percent consisted of a black muck-like material with no discernible firm bottom. The Contractor incurred increased cost as a result of hauling in 36,000 cu yd of rock to stabilize the area. The DSC also increased cost since the Contractor had to use a slower and more expensive method to clear the area of trees. The Contractor had to stabilize the area with rock and use a winch jacked up on the rocks to pull trees, when it had a intended to use a large Caterpillar D-bulldozer to push over all the trees. The Contractor interpreted the contract to say that the typical soil profile in the lagoon area would be humus, clay, and sand in that order down from the ground surface and that the water table would be 4 ft below surface.

Site Inspection:

A site inspection confirmed that soil would be typical. The DSC encountered was not detectable based on site inspection and examination of a test hold sample. The conditions were found at only one section of the work site, and that site was not accessible at the time of the site inspection.

Government Action:

The Government agreed to issue a modification (a change order) as a result of conditions encountered. The Government was aware the of condition before the rocks were hauled and it decided how the condition could best be solved. The Government held that contractor should have anticipated the claimed condition since he should have detected the water in the sample profiles of the soil. The CO denied claim based on failure to comply with notice requirement.

Rationale Used to Award Contractor an Equitable Adjustment:

(1) Provide notice of alleged DSC condition not of increased cost:

DSC clause does not require that the Contractor notify the Government of anticipated additional costs due to DSC. It requires only that the Government be notified of the DSC. Therefore, official written notice is not necessary when Government would use the same methods as contractor to take care of problems caused by DSC.

Citation: *J. J. Welcome Construction Co., v.* GSBCA., 2793, 70-1 (1974).

Liles Case

Summary:

The Contractor entered into a contract with the Government to renovate and repair 800 units of housing at MacDill Air Force Base outside Tampa, FL. The contract required that the Contractor relocate ceiling fixtures and extend concealed existing wiring to the new fixture locations in previously lowered ceilings of the Government buildings. Court overruled the Armed Services board of Contract Appeals (ASBCA) and decided that the Contractor was entitled to an equitable adjustment for his cost incurred for eliminating substandard wiring, when the contract made no mention that such wiring should be eliminated since it could be inferred from the contract that standard wiring would be encountered. Contractor anticipation of standard wiring as neat and workmanlike was reasonable.

DSC Claim:

The Contractor submitted a claim for Type I and or Type II changed condition on behalf of its subcontractor for changed conditions involving poor wiring encountered in the area intended for the air-conditioning ducts. When the subcontractor began to install air-conditioning ducts in the cavity above the lowered ceiling, it found the existing wiring fanning out in as many as four or five circuits in semi-rigid sleeving, and high into the ceiling cavity, effectively prohibiting it from running ducts through the same space. The Contractor further argued that the location of the circuitry was unknown, and differed materially from locations and posture normally encountered in such work. The circuitry encountered was substandard and as a result had to be eliminated before the subcontractor could continue air-conditioning duct work. The Contractor sought an equitable adjustment for the extra cost incurred as a result of eliminating existing substandard wiring.

Contract provisions:

The ASBCA stated that specific references in the contract, such as, "may require rerouting of wiring," or "circuits' continuity shall be maintained," and "Contractor is responsible to insure circuit continuity," showed that the Contractor should have anticipated the wiring conditions encountered. However, the Court rejected ASBCA's argument holding that these phrases in the contract applied to the switches and panels and not the fixtures in question. The Court further stated that "even if these references were applicable, in our view, they are not sufficient to warn an experienced electrical contractor that substandard workmanship in the existing wiring was to be expected."

Government Action:

The architect-engineer agreed that the subcontractor would be paid on a time and material basis. The CO immediately rejected the claim on the basis that the relocation and replacement work was required under the contract, citing both drawing and specifications in support of his position. The ASBCA agreed with CO and concluded by noting that there had been no representation that the circuits ran flat on the joists or that there would be no interference between the existing circuits and the duct runs, and that rerouting the circuitry to make room for the ducts was both implied in the general plan of rehabilitation of the building and expressed in drawings notes and symbols.

Site Inspections:

The DSC wiring could not be revealed to the contractor after a reasonable site inspection even after a careful reading of the drawings. Contractor had no reason to believe that the previous concealed electrical work was not done in a neat and workmanlike manner.

Rationale for Awarding an Equitable Adjustment:

(1) Interpretation of contract:

A reasonable inference is that the government employee who drafted the specifications and drawings considered the relocation of the ceiling fixtures of little moment. The notes in the drawings refer to "extend" and "relocate" but not "replace."

A careful study of the drawings and specifications would imply that the previous electrical workmanship was of standard quality except where the contrary was noted. These plans and specs did not indicate that substandard wiring would be encountered. The plans made no indications as to just where the wiring was to be found. The Government could not find any representation in the drawings of more than three runs from a fixture, yet as many as four or five had been encountered.

(2) Where Contractor interpretation of plans and specs is reasonable, the Court will agree with Contractor's interpretation of the contract:

The Court agreed with the Contractor that it was reasonable in expecting the existing work would be neat and would not transverse the space where the ducts were to run. The Contractor's interpretation of the contract was reasonable given Specification TP-24-20b(b) which directs "all work be done in a workmanlike manner and in accordance with best current practice," and TP-24-03(c) which incorporates by reference the National Electrical Code, NEPA, which directs "electrical equipment shall be installed in a neat and workmanlike manner." In light of these specific admonitions, the Contractor could reasonably assume that previous Government work would also require neat and workmanlike installation when ceilings were lowered.

(3) Contractor's responsibility under the Site Inspection Clause:

Since there was no mention in the contract of putting the air-conditioning ducts inside the wall, the Contractor, even during a site inspection, had no way of knowing that the existing wiring would interfere with the air-conditioning duct work. It is not necessary for the contractor "to poke a hole in the ceiling" to discover latent defects.

Citation: *Liles Construction Company, Inc. v. United States*, 455 F.2d 527 (1972), 197 Ct. Cl. 164

Massman Case

Summary:

The Contractor entered into a unit-price contract with the Government to construct 4010 linear ft of revetments and dikes on the Missouri River downstream of the Garrison Dam on Lake Oahe, ND for $278,608. Price adjustments were subject to Variation in Estimated Quantities Clause which exceeded 15 percent of the estimated quantities. The project was to be completed within 150 days, with a completion date set for July 10, 1978, but it was not completed until November 2, 1979. The Contractor was awarded an equitable adjustment under the DSC clause because the CO conceded that modifications made to contract constituted a DSC, even though severe weather, generally considered an Act of God, by itself is not considered a DSC. The CO denied only a few claims as a result of the alleged DSC, and the Board agreed with CO that those additional DSC claims should be denied, holding that the Government was not responsible for Acts of God, unless they interact with unanticipated subsurface or latent condition and since Contractor's remobilization and standby equipment costs occurred during a time when actual water flow was 14,000 to 16,000 cfs and contract noted 8,000 to 14,000 cfs. Thus, the Contractor was unreasonable to anticipate 15,000 cfs when monthly average during this period was noted in the contract as 22,000 to 25,000 cfs. (Since CO conceded to other alleged DSC claims, these were affirmed).

DSC Claim:

The claim involves a Type I DSC when the Contractor encountered higher than anticipated spring water flooding and river flows. The contract stated that the range of river flow would be from 8,000 to 40,000 cfs during open water season. The Contractor claims that in addition to other claims already conceded by the CO due to the DSC, he is also entitled to adjustments for standby equipment costs and remobilization costs.

Notice:

The Contractor complied. Notice was not an issue since the CO already conceded that previous modifications were issued as a result of DSC.

Government Action:

The CO admitted liability through that period where the river flows were only 30,000 cfs, (contract noted 8,000 - 40,000 with average 22,000 - 25,000) so the issue of whether this period actually resulted in a DSC was not addressed. The CO agreed with contractor that DSC was encountered and added $87,567 to his initial unilateral modification of $23,000 and extended contract time by 423 days. The Contractor refused to execute the modifications, protesting both price and time adjustments and revised its claim to a total price of $227,567. The CO denied Contractor's additional claims.

Rationale For Awarding DSC Equitable Claim:

(1) CO admitted liability:

The CO conceded that previous modifications were issued as a result of DSC.

Rationale For Denying DSC Equitable Claim:

(1) Acts Of God:

Acts of God (such as severe weather) by themselves do not constitute a DSC unless such weather (a nonstatic condition) interacts with a misrepresented (Type I) or unknown/ unusual (Type II) condition.

(2) Contractor anticipation of conditions to be encountered must be reasonable:

The Contractor should not have anticipated only 15,000 cfs. Court was "hard pressed to surmise..." how Contractor reached the assumption that he should have anticipated 15,000 cfs. Contract documents showed that average river flow was 22,000 to 25,000 cfs, so contractor's anticipation of 15,000 cfs was unreasonable. The Contractor was fortunate to have the low river conditions it actually experienced during this period, which was at times even lower than what the Contractor anticipated (14,000 cfs).

Another judge agreed with the outcome of the Board's decision, but added, "...Because this case did not actually address the question of whether a DSC existed in most of the Contractor's claims, this case should not be taken as bad law. Extreme weather which may result in high river flows may give rise to a right to time extensions but do not give rise to entitlement, a price adjustment, without some additional, intervening act of the Government in its contractual capacity... ."

Citation: *Massman Construction Company v. Eng BCA*, 4760, 86-B.C.A (1986)

Morrison Case

Summary:

The Contractor entered into a contract to improve a 45 mi. segment of an existing roadway from Valdez to Fairbanks, AK and hired a subcontractor for a portion of this work. The Contractor successfully appealed the Board's decision which denied DSC claim, holding that under the contract, the Contractor's claims were limited to DSC Type II or the Changes Clause, and that in addition, either claim was subject to the limitation of 25 percent cost overruns as a result of the Estimated Quantities Clause. The Court overruled the Board's decision, holding that Contractor was entitled to an equitable adjustment as a result of changes in borrow pit locations ordered by the Government and that its equitable adjustment was not limited to the Estimated Quantities Clause of cost overruns exceeding 25 percent of the estimated bid quantities. The Court made it very clear that it did not matter that the claim came under the Changes or Changed Conditions (DSC) Clause, since the limiting effect of Special Conditions Clause (Estimated Quantities) could not affect the amount to be awarded under either Clause.

DSC Claim:

Contractor made claims based on Changed Conditions or DSC and Changes Clause. Under the DSC claim, the Contractor argued that he encountered subsurface and/or latent conditions in borrow pits designated by the Government which differed materially from those shown on the drawings. Of the 29 locations originally designated on the drawing to be used as borrow pits, 12 pits failed to project any suitable borrow material, three pits failed to yield 30 percent of the quantity designated on the drawing, and four pits failed substantially to yield the designated quantities.

Under the Changes Clause, the Contractor argued that various Government orders asking the Contractor to substitute borrow pits or enlarge such pits, without regard for the fixed station points (or balance point) assigned on the drawings, resulted in changes for which the Contractor is entitled to an equitable adjustment.

Contract Provisions:

Contract Clause 4.2 "Subsurface and/or Latent Conditions at the Site," provided in part: "...that the words "subsurface and/or latent conditions at the site" as used in Article 4 (Changed Condition Clause) shall be construed to mean and to refer solely to conditions of an "unusual and unknown condition... ."

This Special Clause limited the Changed Conditions Clause to apply to only Type II conditions: (Consequently, the Contractor could base a claim under Changes Article [see note below*]).

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*Under the Changed Condition or DSC Clause, the Contractor submits a claim if (Type 1) the indications in the contract regarding subsurface or latent conditions are materially different than what was encountered, OR (Type 2) the conditions encountered are materially different from what is known or usual and inhering in this type of work. Article 4.2 changed that by provided in part: "...that the words "subsurface and/or latent conditions at the site" as used in Article 4 (Changed Conditions Clause) shall be construed to mean and to refer solely to conditions of an "unusual and unknown condition... ."

Notice:

The Contractor wrote CO that the change in the borrow pit locations had resulted in much longer hauls than had been shown on the plans, thereby increasing his costs.

Site Inspection:

The Contractor conducted a reasonable site inspection, since an experienced contractor could only have anticipated the failure of 10 percent of the borrow pits, but not the failure of 65 percent of the designated pits.

Rationale For Awarding An Equitable Adjustment:

(1) Contract Clause 4.2:

"Subsurface and/or Latent Conditions at the Site," limited (DSC) Changed Conditions Clause to apply to only Type II Conditions, but it did not prevent Contractor from seeking an equitable adjustment under Changes Clause.

(2) Interpretation of changes and changed conditions clauses:

All clauses must be construed as having a reasonable meaning and should not be considered superfluous unless no other interpretation is possible. Therefore, a Special Condition Clause (Estimated Quantities) which purports to limit the Government's liability to cost overruns that exceed 25 percent should not be construed to make the Changes or Changed Conditions Clause superfluous. Both the (DSC) Changed Conditions Clause and Changes Clause must be construed to mean that whenever the contractor costs are materially increased, Contractor is entitled to an equitable adjustment for all increased costs incurred as a result of the DSC or Changes Clause of the contract. Thus, Estimated Quantities clause cannot serve to deprive contractor of his right to recover extra cost of doing work made more difficult by such unforseen borrow pit conditions and performed under an order of CO.

Citation: *Morrison-Knudsen Company v. United States*, 397 F.2d 826 (1968), 184 Ct. Cl. 661.

Pacific-Parker Case

Summary:

The Contractor entered into a unit price contract to build 2.366 miles of graded road in Washington State Mt. Baker National Forest at a cost of $870,069. The Contractor's appeal to the Board was denied because the DSC Type II claim conditions encountered were "known" and "usual" and increased costs incurred by Contractor were a direct result of poor drilling methods and not the alleged DSC.

DSC Claimed:

The claim cited Type II hardness and abrasiveness of the rock (garnet gneiss) of an unusual nature which differed materially from those ordinarily encountered and recognized as inhering in the work. The Contractor argued that the hard rock (garnet gneiss) encountered increased drilling costs, and it seeks an equitable adjustment of $207,862.89. The formation encountered changed immediately beneath the surface, where material broke to sizes as large as 15 cu yd. Fault lines not evidenced on visual inspection resulted in overbreak, causing the loss of many predrilled holes. Widely spaced cleavage planes with many changes in direction made secondary shooting necessary and increased the handling cost.

The Contractor's expert noted that one part of the job had more gneiss than normal and that it would take a trained geologist to detect this rock upon visual inspection.

Conversely, the Government's expert testified it was not a Type II condition since the rock type and structure were the same in the project as in the surrounding 20-mi. area, and consequently they were not unknown, unusual, or materially different than should have been anticipated. Quartz stringers of the same hardness as gneiss were found throughout the project, so gneiss should not have posed any more difficulties.

Moreover, the Government's expert noted that accepted drilling procedure for this type of condition would be to use one drilling bit for each 30-ft cut, and the Contractor was unreasonable to use one bit for 80-ft cuts. Therefore the Contractor's increased cost was a result of unsatisfactory drilling methods and not a result of the type of rock (DSC) encountered.

Contract Provisions:

The contract called for "unclassified excavation" of an estimated 360,000 yd at $1.30/yd.

Site Inspection:

The Contractor assumed that the rock with brownish cleavage faces indicated that it might be ripped or at least softer and cheeper to drill then solid gray rock, despite the fact that outcrops of the hard rock later encountered were apparent upon visual examination.

Notice:

The CO waived notice requirement since Government engineers were aware of problems encountered.

Rationale for Denying An Equitable Adjustment:

(1) Contractor's responsibility under Type II DSC:

Under a Type II DSC category the Government has elected not to presurvey and represent the subsurface conditions. The contract made no indications of the subsurface conditions to be encountered, and bids were solicited on an "unclassified" excavation basis. Consequently, the contractor must demonstrate that he has encountered something materially different from the "known" and "usual." The Court agreed with the Government's experts, who were very familiar with drilling and blasting. Their test proved that blasting gneiss and similar rock with quartz stringers had the same speed as drilling.

(2) Increased cost must be directly related to DSC:

It is necessary under a Changed Condition Clause (DSC) that conditions encountered be materially different and that the Contractor's costs be thereby increased by that difference. The Contractor could not prove that its costs were in fact related to the hard rock found since it actually appeared that increased costs were due to improper drilling methods. Additionally, Contractor could not prove the hard rock was not generally recognized as usual in this geographical area.

(3) Site inspection must be reasonable:

The Contractor's assumptions, made at the site, that in certain locations the rock could be ripped or that at least it was softer/cheaper to drill proved to be unreasonable. The Contractor could not prove that hard rock was not generally recognized as "usual" in this area.

Citation: *Charles T. Parker Construction Company v. United States*, 433 F.2d 771 (1970), 193 Ct. Cl. 320

Perini Case

Summary:

The Contractor entered into a contract with the Army to construct the Hidden and Buchanan Dams in California for $29,147,718. The Hidden Dam is of earth fill construction and is approximately 5,700 ft long. The Buchanan Dam is of rockfill construction and some 1,800 ft long. The Contractor was entitled to a DSC Type I equitable adjustment for actual cost of performing grout placement work since grout placement differed substantially from "Estimated Quantities" noted in the contract. The Contractor was reasonable to rely on such quantities because neither the contract documents nor site inspection would have revealed that the quantities noted were unreliable. The Government's claim that the case should be dismissed for failure to give timely notice was denied since the Government was aware of the condition and failure to give notice did not prejudice the Government.

DSC Claim:

Both Hidden and Buchanan Dams required grout curtains in the foundations along the center lines and secondary grout curtains parallel to and on each side of the center lines. A Type II DSC was encountered when grout take was low. It was necessary on the Hidden Dam project to expand the drilling program in spite of low grout take because most of the fractures in the foundation were vertical or nearly vertical and it was necessary to drill additional holes to intercept the vertical fractures and fill them with grout. In the Buchanan project, the rock structure tended to force the grout to travel in the desired direction, parallel to the grout curtain, but there was a problem with grout leaking through surface fractures. It was necessary to drill additional holes along the secondary lines to seal the fractures. Both conditions caused additional drilling and extended grouting efforts despite the low grout take. The quantity of drilling and grouting actually accomplished differed substantially from the estimated quantities stated in the invitation for bid (IFB).

The Government argued that the Contractor's case should be dismissed since he failed to give notice. Further, the estimated quantities of grout are only about 50 percent accurate; therefore, the Contractor should have anticipated the variation in the grout estimations noted in the contract.

Contract Provisions:

Estimated Quantities of Grout/Drilling

	Bid Indicated:	Contractor Encountered	% Changed:
	Hidden Dam		
Drilling	110,001 lin ft.	124,969	+13.5
Grouting	64,000 cu ft.	18,234	-71.6
	Buchanan Dam		
Drilling	56,000 lin ft.	69,516	+24
Grouting	18,500 cu ft.	12,286	-33.6

Site Inspection:

Neither a careful examination of the site nor the contract documents would have told a bidder of the inaccuracy of the Government estimates for placing grout.

Government Action:

The Government's Resident Engineer agreed that the Contractor got as much grout into the ground as was physically possible. He stated that he would not have changed the procedures on the project if he had been informed that the contractor would submit an equitable adjustment.

Rationale For Awarding an Equitable Adjustment:

(1) Notice requirement rarely enforced unless Government is prejudiced by Contractor's notice failure:

The Engineering Board is reluctant to bar a claim on the technical ground of lack of written notice where there has been no prejudice to the Government. Since the Government was aware of the facts giving rise to the DSC claim from the beginning, it is clear the timely written notice would not have resulted in alternative approaches in overcoming the condition.

(2) Material variation in the Estimate Quantity Provision does not automatically constitute a DSC Type II condition, unless it is found that it is reasonable to rely on such provision:

If the Contractor is unable to reasonably have expected a material variation in the estimates, or for other reasons had the right to rely on the Government's estimates when submitting his bid, Contractor is entitled to a DSC Type I equitable adjustment. Here, a careful examination of the site or contract documents would not have told a bidder of the inaccuracy of the Government's estimates for placing grout. The Court did not accept the government expert's testimony that grout estimates are inherently unreliable and that 50 percent accuracy is all the Contractor should have expected.

(3) Materiality definition:

The primary consideration in determining the materiality of the changed condition is the amount of extra work involved in overcoming the changed condition. The contract has established that the work of placing units of grout was greatly increased by the changed condition, i.e., lack of groutable voids. In effect, the Contractor was required to expand efforts similar to that anticipated by both parties, but was compensated at less than 40 percent of that anticipated for grout placement.

Citation: *Perini Corporation v. Eng BCA*, 3745. 78-1 (1978)

Portable Rock Case

Summary:

The Contractor entered into a unit price contract with the Government for construction of the Moonlight timer Sale road in Oregon for $158,355. Contractor's DSC Type I claim was denied since the "indications" in the contract, Contractor's past experience in area, and a prudent site inspection should have appraised the Contractor that wet soil conditions existed.

DSC Claim:

The Contractor seeks an $158,355 equitable adjustment for Type I DSC conditions when it found subsurface water conditions--not specifically indicated in the contract--which substantially increased costs in all phases of its construction work. This work included log decking, excavation, slash and brush removal, placement of subgrade reinforcement and cushion materials. The ground conditions were extremely wet and soft causing the equipment to settle down into the mud. The contractor also argued that the Government had superior knowledge of the situation, i.e., it had in its possession reports, not disclosed to bidders, that characterized the soil as clay loam, and stated that subsurface drainage was probably the most significant problem associated with this area. The Contractor also argued that the Government's issuance of modifications established that the DSC did exist.

Contract Provisions:

The Contract stated that a deep, reinforced subgrade along the entire lower road was necessary, before the installation of base course work. (The Contractor did not take this to mean that he should anticipate water problems.) The contract also noted that "culverts were provided at crossings which were flowing streams; subgrade reinforcement was in fact specified; and drainage was provided in the form of perforated pipe and ditch, were necessary... ."

The contract provision entitled, "Utilization of Excavated Materials," also provided that "excessively wet material which is otherwise suitable for embankment will be field drained and dried before placement."

Site Inspection:

The Contractor reviewed the site and noted a bog area as "...just a big hole with water in it...too big to drive his vehicle across...about 150 to 200 feet long and that he was aware of the couple of small streams crossing the road in a couple of places, but that he did not think it was going to present that much of a problem." The Contractor concluded that the soils probably were not up to par where it would hold a subgrade; therefore a couple of feet of subgrade reinforcing would be needed.

Government Action:

The Government issued two modifications (change orders), one for an additional 29 ft of perforated pipe and an additional 18-in. corrugated metal pipe and a second for the required removal of 3 ft of material in the bog area, and its replacement with crushed rock.

Rationale For Denying Contractor's DSC Type I Claim:

(1) Contractor interpretation of contract must be reasonable:

Subsurface water problems are not uncommon on road construction projects in the area and are normally corrected with perforated pipe and replacement of wet soil as was done here. The 1 to 2 ft of reinforced subgrade specified in the contract was a clear indication of unstable soil conditions. The design of the lower road was significantly different, indicating a low strength subgrade, unstable in the presence of water. This should have alerted a knowledgeable contractor, aware of the location and topography of the lower road, to the presence of ground water and wet ground conditions.

(2) Unit price contracts and change orders issued:

Generally, discovery of a DSC may result in the issuance of a change order only when the condition encountered was substantially different than anticipated, and the project can no longer be built as it was originally designed. In the present case, issuance of a few change orders reflected an equitable adjustment. More importantly, the project was built exactly as it was designed, and it was completed 50 days earlier than noted on the contract.

(3) Reasonable contractor uses his knowledge of area:

The Contractor had in fact encountered wet conditions on steeper, higher ground when constructing another Forest Service road in that vicinity in 1978 and had found it necessary to replace unsuitable material with short rock on that occasion.

Citation: *Portable Rock Production Company v. United States*, 4 Cl. Ct. 495 (1984)

Ray Case

Summary:

The Contractor entered into a contract with the Government to replace 3,893 mi. of existing road in Great Smokey Mountains National Park from Gatlinburg, Tennessee, to Cherokee, North Carolina (the unit price contract was for $667,355). The Contractor appealed the Board's decision which denied it a Type I DSC claim because it failed to request borings which are customarily available from the Government and mistakenly relied on a standard compaction clause as indications of subsurface conditions to be encountered. The Court overruled the Board's decision, holding that the Compaction Clause constituted standard procedures to be used for compaction and was the only specification relating to the contract. Since the Contractor could not follow such compaction procedures, the Contractor is entitled to an equitable adjustment.

DSC Claim:

A Type I claim was made saying the wet soil conditions encountered differed materially from those indicated in the contract. Compaction procedures indicated in the contract were impossible to fulfill, causing the Contractor to use more expensive methods of compaction and resulting in delays in completion of 637 days. (For delays caused by suspension of work due to weather, the Contractor was not given an equitable adjustment, just time extensions for these delays). The contract required the material excavated from the cuts to be used for building fills. The Contractor could not achieve compaction as specified by the Compaction Clause. Instead, the Contractor reverted to letting the material dry into a state of compaction in layers. This was very slow and also involved scraping a layer of partially air-dried soil and then moving it to another area. High moisture content increased embankment, excavation, and equipment costs. Excavation of the soils from cuts, tended to turn them into mud and made them lose strength. Soils too muddy for operation of rubber-tired equipment had to be performed by crawler equipment, which was slower and less economical. Cuts had to be excavated piecemeal in shallow layers so that the soil could dry. These layers had to be left undisturbed for days to regain their strength. Equipment and men had to be moved from one cut to another to keep the job going. Six borings made by the Government, which were not included or referred to in the contract would have given the Contractor adequate warning of the wet soil. The Contractor's expert concluded that the soils, naturally low in strength and weaker still after manipulation or remolding, were largely unsuitable for successful use in construction of roadway embankments. (A few years later, the Contractor and its expert witness proved to be correct, because the Government had to have parts of highway embankments rebuilt.) A standard proctor test proved that much of the soil had a natural moisture content materially higher than "optimum," which caused greater expense.

This was not caused by the Contractor or the weather. It is suspected that the high moisture content came to the surface under the vibration of traffic, ruined the pavement, and caused its disintegration.

Contract Provision:

Article 106-3.5, "Compaction," provided in part, "...all embankments shall be compacted as follows...each layer, except those containing rock, shall be moistened or dried to a uniform moisture and then thoroughly compacted by rolling with tamping or pneumatic-tired roller or 3 wheel power rollers... . Contractor shall perform additional rolling as may be necessary to obtain required density. AASHO T99 material must pass a 3/4 in. sieve. Other equipment can be used as long as the density is not less than 95 percent of that required."

Site Inspection:

Reasonable site inspection, given the heavy snow, could not have detected the wet soil condition. Six soil borings pertinent to the job were not disclosed to the Contractor or noted in the contract.

Contract Interpretation:

These borings which were not disclosed to the Contractor would have sufficiently forewarned a prudent contractor that the soil would be difficult to handle when wet.

Government Action:

The Government's engineer testified that he did not know what to do about the soil and would have sought expert advice.

Notice:

From the very beginning, the Contractor informed the Government that the material was unsuitable (abnormal moisture retention) and that it was unsatisfactory for highway construction.

Rationale For Awarding Equitable Adjustment:

(1) Contractor relied on Compaction Clause:

The Government's Compaction Clause indicated conditions to be encountered, since "It would be insane to suppose that this article on compaction and all the specification were in this contract for no purpose." This Compaction Clause noted specific equipment needed and described the standard procedures followed to obtain optimum compaction. However, the Contractor had to follow a more costly and time-consuming procedure because of the high moisture content of the soil.

(2) Ambiguous data in contract read against Government/drafter:

Even if the Compaction Clause was found not to fall under "indications" in the contract, its presence makes the contract ambiguous and therefore will be read against the Government.

(3) Awareness of DSC could be inferred:

The Contractor was not charged for a delay of more than a year. The Government thus recognized that the circumstances encountered should not have been anticipated and were beyond the Contractor's control.

Citation: *Ray D. Bolander, Inc.*, v. *United States*, 186 Ct. Cl. 398 (1968)

Robertson Case

Summary:

The Contractor was awarded a contract with the Government to repair and replace certain utility systems at Tinker Air Force Base in Oklahoma for $100,272.81. Contractor successfully appealed an Armed Services Board of Contract Appeals (ASBCA) decision which denied his Type I DSC claim. The ABSCA held that the contract did not indicate the thickness of concrete to be encountered and that the Contractor should have anticipated that the concrete was more than 6 in. thick. The Court overruled the ASBCA's decision, holding that the Contractor was reasonable, given its site inspection and interpretation of the contract, to expect that the concrete would be 6 in. thick and that because it encountered substantially thicker concrete, the Contractor was entitled to a Type I DSC equitable adjustment for $7,000.

DSC Claimed:

The Contractor seeks an $7,000 equitable adjustment for Type I DSC encountered when he found thicker than anticipated concrete, which was in some areas, 18 to 24 in. thick and his site inspection and interpretation of the contract drawings showed that he should only have reasonably anticipated 6-in. concrete.

Contract Provisions:

The Contract specification did not indicate the thickness of the concrete, but Paragraph 3-06 provided that all buildings shall be restored to their original condition. A contract provision entitled "Floor Plan Showing Drainage Piping to Be Replaced" showing the cross-section of the concrete floor was a no-scale drawing. The drawing showed a floor drain which ran through the concrete. The drain was connected to a P-Trap below the floor by a nipple. The nipple was 6 in. long, as drawn, extending from a point just below the bowl of the floor drain (running through the concrete) into a joint on the P-Trap.

Contractor's Contract Interpretation:

The Contractor concluded that the concrete floor was 6 in. thick by first comparing the length of the nipple with the cross-section of concrete indicated in the drawing. Then Contractor compared the concrete cross-section with the actual measurement of the Government-approved floor drain and P-trap, when connected by a 6-in. nipple.

DSC Claimed:

When excavation began, the Contractor encountered concrete substantially thicker than 6 in. In some areas, the floor was 18 to 24 in.

Site Inspection:

The Contractor conducted a reasonable site inspection by measuring a hole in the floor and concluding that the concrete was approximately 6 in. thick.

Rationale for Overruling the ASBCA's Decision in Favor of Contractor:

(1) Interpretation of indications in contract:

Indications in the contract do not have to be specific representations to come under the scope of the DSC Type I clause, they can be inferred or implied. The Contractor compared the drawing with the actual measurement of the approved floor drain and P-trap when connected with a 6-in. nipple, and it was reasonable to anticipate that the rest of the concrete would be 6 in. thick.

Citation: *J. E. Robertson Co., Corp. v. United States*, 437 F.2d 1360 (1971); 194 Ct. Cl. 289

Schnip Case

Summary:

The Contractor entered into a fixed-price contract with the Navy to perform excavation and other necessary work in the construction of the hobby shop at the Navy's Submarine Base, Groton, CT for $1,551,323. The Contractor's claim for an equitable adjustment for encountering soft or seamy rock when plans and specs noted hard rock was denied by the Armed Services Board of Contract Appeals (ASBCA) because the Contractor failed to give notice to the Government before the condition was disturbed (blasting and excavating operations were completed), and conflicting evidence could not prove that Government knew or should have known about the condition before written notice. The case was appealed, but the Board's decision was reaffirmed.

DSC Claimed:

The Contractor held that the subsoil conditions differed materially from the conditions normally to be expected from the contract furnished by the Government. The Contractor expected hard rock past the depths of the borings noted in the contract but found soft rock or rotten rock. Blasting could not be controlled in this softer stratum so more excavation was necessary. The Contractor was unable to achieve the level horizontal plane at the bottom, and the smooth sides necessary to pour foundations. Thus, contractor had to use man-made wooden forms for pouring the footings.

Contract Provisions:

Specifications stated in part that "hard material will be encountered as indicated from the borings. Six borings had been done at the site to depth ranging from 6 to 7 ft, and specifications defined the hard material as solid rock, not ordinarily removed without systematic drilling and blasting. The project was to be completed in 540 days. Although the Contractor's work included depths ranging beyond 7 ft, it was assumed by the Government and the Contractor that the material encountered below 7 ft would be hard solid rock.

Notice:

The Contractor gave written notice to the Assistant Resident Officer two days after the Contractor completed blasting and excavation, and submitted a claim for $63,3576 and 30 day extension. The claim was denied.

The Contractor argued that notice was given when it orally requested the use of wooden forms since it informed the Government at that time that the wooden forms were needed because the rock was very "seamy" and it was impossible to obtain smooth lines. The Contractor also argued that since the Government's engineer regularly visited the site, he should have been aware of the DSC.

Government Action:

The Government denied the claim that the notice requirement had been met. The Government testified that although they agreed to allow the Contractor to make wooden forms for pouring the footings but said they agreed only because "it was difficult to cut out the rock for excavation in such a way that the rock remaining could be used to contain the concrete for the foundation footings." The Government's written report of the meeting discussing the approval of the wooden forms did not mention the rock problem. Government experts testified that they thought the use of wooden forms was requested by the Contractor for its own benefit.

Rationale for Denying Equitable Adjustment:

(1) Government awareness:

The Contractor could not prove that the Government was aware of the DSC just because the Government's representative made regular visits to the site.

(2) Notice after condition was disturbed caused prejudice:

The Contractor's failure to give notice until after blasting and excavation prevented Government from ascertaining whether the foundation problems resulted from a subsurface condition that was unexpected or from the use of an improper blasting procedures. Untimely notice was prejudicial to the Government since it effectively prevented the Government from verifying Contractor's claim or employing alternative remedial procedures to take care of the DSC problem if it was found to exist.

(3) Contractor failed to meet burden of proof:

In reviewing the Board's decision, it is necessary to proceed on the premise that any factual determination made by the Board must be accepted by the Court as final and conclusive for the purposes of the litigation unless such determination is shown to be fraudulent, capricious, arbitrary, so grossly erroneous as necessary to imply bad faith, or unsupported by substantial evidence. The Contractor had the burden of persuading the Court that each finding was wrong. The Contractor failed to meet this burden. Furthermore, the Court was not required to make an independent search of the record to ascertain whether the factual findings challenged by the Contractor did or did not meet the standard. The Contractor had that responsibility.

Citation: *Schnip Building Company v. United States*,128-79C Ct. Cl (Slip Oppin. 1980)

Select Case

Summary:

The Contractor entered into a contract with the Government for deepening an existing harbor by hydraulic dredging for $308,500 at Port Hueneme Harbor, Ventura, CA. It was estimated that the project would involve 110,000 cu yd of dredging. Contractor was awarded a DSC Type I equitable adjustment when the contractor encountered very hard material, instead of loose sand as noted in a Character of Material Clause.

DSC Claim:

The Contractor requested an equitable adjustment for $225,000, alleging that the material dredged by the Contractor's 12 in. dredge was harder than indicated in the contract clause entitled "Character of Material." The Government stated that the Contractor should have known that new dredging was involved, and that the Character of Materials Clause was only a general description of materials found, not an exhaustive list of specific materials to be encountered. Additionally, the Government stated that poor production resulted from the booster pump failure rather than the materials encountered and that the Contractor's losses were really due to the sinking of its 16 in. dredge, "Sandstorm," not a differing site condition.

Contract Provisions:

The Character of Material Clause provided in part that materials to be dredged might contain harbor-type debris but would predominately consist of fine grain sand. No borings or other exploration were made in connection with this contract. The Government was aware of another contractor working in the area having problems resulting from encountering hard sand.

Contract Interpretation:

The Contractor held that the Character of Material Clause was relied upon when it submitted its bid and as a result, it estimated that it could expect to dredge 175 to 200 cu yd/hr. The Contractor believed that it was a maintenance dredging job.

Government Action:

The Government approved use of "Uba," a 10 in. portable dredge, as suitable for dredging subject to use of booster pump in the discharge pipeline. The Government suggested that an additional 60,000 cu yd of dredging would be procured, and the Contractor raised the possibility of using a 16-in. dredge, the "Sandstorm," but it sank in front of the shipyard while en route to Port Hueneme from San Francisco. The Government agreed to allow another contractor to dredge the soft material with a 16-in. dredge, the "Headway." The Headway also had encountered very hard sand and was having problems, and the teeth on its cutter head had to be changed unusually frequently. Government personnel later viewed the site and found high spots in the area, so the subcontractor using "Headway" went over the area again, but the Government was not satisfied and hired another contractor with a 10-in. dredge to complete the job. The dredge was equipped with a water jet instead of a cutter head, and it disposed of dredged material by moving such material 100 to 200 ft from the point of dredging and depositing it underwater in areas of harbor bottom believed to be deeper than -35 ft mean lower low water (MLLW). Government experts found new high spots and the subcontractor went back into the harbor with "Headway" as a favor to the Government and removed the new high spots. The Government deducted the amount paid to the subcontractor from prime contractor's contract through a modification. The Contractor protested.

Site Inspection:

The Contractor conducted a site inspection but did not make an investigation on soil conditions in the bottom of harbor. The Government held that a reasonable site inspection including inquiries to the Navy and the Corps of Engineers have informed the Contractor that the project was one of new dredging and not maintenance dredging.

Notice:

Written notice was given to the Government. The Contractor encountered very hard material, and there was no dispute on the point that Government was aware of the problems. The Contractor also had problems with the booster pump.

Rationale Used In Awarding Type I DSC Equitable Adjustment:

(1) Character of Material Clause and Contractor's right to rely:

The Contractor reasonably relied on the Character of Material Clause in basing its bid on the assumptions that the contract work would be maintenance dredging and that the material to be encountered would be predominately loose and easy-to-dredge fine grain sand. There were no indications that new dredging was involved, unlike the Government asserts.

> The phrase in the clause, "...no borings or other exploration have been made..." supports the Contractor's view that if the Government did not bother to make borings or other explorations in connection with this contract and yet would characterize the materials to be encountered, it is reasonable to conclude that the Government learned the nature of the material from earlier work.

The Government should have included information regarding the area in its contract, especially afte- being warned by the contractor working in the adjacent area that hard digging was being experienced.

Citation: *Select Contractors, Inc., v. Eng BCA*, 3855, 3919, 79-2 (1979)

Turnkey Case

Summary:

The Contractor entered into a contract with the Government to repair seven storm damaged sites on the Mad River Road located in the Six Rivers National Forest in Northern California for $106,790. The Court affirmed the Board's decision (denied the Contractor's appeal), holding that it was not entitled to equitable adjustment under a Type I or Type II DSC caused by drought condition since weather conditions such as droughts are Acts of God and there was no interaction with an indicated (Type I) condition or an unknown or unusual (Type II) condition, because the Contractor was informed of the drought which occurred after the contract award and Government never informed the Contractor that water would be available throughout the contract period.

DSC Claimed:

The dispute centers on the preparation of the filter material, the main component of which was gravel. Preparation of filter material which would meet the contract specification required the use of a screening plant to separate various sizes of rocks, including separation of unwanted fines. (Fines are powder-like substances that adhere to rock and generally must be washed away.) The screening plant was operational on September 22, 1970. Water ceased flowing in the Mad River in September, after the contract was awarded. Both the Contractor and the Government agreed that adequate quantities of water were not available to complete the work under the contract. Contractor claims that for this 22-day drought period his costs were increased since he was forced to haul water to the screen plant site from other sources (Barry Creek, 1 mi. from the site and after this water was exhausted, the Contractor hauled water from another source 10 mi. from the plant. Contractor is seeking an equitable adjustment of $44,665.00. In the alternative, Contractor argues that a Type II (unknown or unusual), DSC was encountered.

Contract Provisions:

A supplemental specification provided in part: "Gravel bars along Mad River are designated as a filter material source and located 1.8 mi. northwest of the project." The Government allowed the Contractor to use another gravel bar site. The contract also required the Contractor to spray roadside slopes with a mixture of mulch, fertilizer, and seed to combat erosion. This process is known as hydromulching.

The Board denied the Contractor's claim, stating that conditions did not differ materially from the contract indications (Type I), and that Acts of God such as drought, under the circumstances of this case are not Changed Conditions (DSC) under the clause.

Site Inspection:

The Contractor made a prudent site inspection. The inspection showed a heavily flowing river. The drought condition occurred 2 months after the contract was awarded.

Rationale For Denying Contractor's DSC Claim:

(1) Acts of God

Webster defines drought as "dryness, want of rain or of water... ." Generally, the Government does not assume an obligation to compensate a contractor for additional costs or losses incurred as a result of solely weather conditions, which neither party expected or could anticipate and which did not arise from any act or fault of the Government.

(2) Site condition indications must be found in contract under Type I DSC claim:

Type I DSC will be denied if the contract documents do not show or indicate anything about the alleged changed condition.

(3) Contractor must show it relied on indications in contract and that DSC claimed is based on that reliance:

Contractor can not claim that it relied on contract documents regarding hydromulching in the Mad River since this DSC claim does not arise as a result of any problems incurred during hydromulching part of the contract.

(4) Contractor's interpretation of contract must be reasonable:

(a) A visitors' map (not part of contract) which showed a dark blue line as a perennial water features does not constitute an indication in the contract since it was not part of the contract. Even if it had been part of the contract the definition of perennial water is "...water most of the year except for infrequent and extended periods of drought... ." Thus, the Contractor cannot argue that this is an indication of available water for the contract work.

(b) The Contractor cannot prove that he relied on local rancher who said that subsurface flow of water would continue after surface water ceased since it did not include costs for special equipment in its bid.

(c) The Contractor cannot claim that references regarding the location of gravel bars as a source for filter material indicated that water would be available throughout the contract because water is necessary for screening. This provision makes no mention of water except to refer to the Mad River as the location of filter material. The fact that the Mad River was mentioned is because it was the nearest river, but it cannot be interpreted as meaning that water would be available at all times during the duration of the contract.

(4) DSC must exist at the time the contract is awarded:

The DSC must have occurred before the contract award. A condition that existed before the contract award, flooding, did not reflect the drought problem.

Citation: *Turnkey Enterprises, Inc., v. United States*, 597 F.2d 750, (1979), 220 Ct. Cl. 179

Welch Case

Summary:

The Contractor entered into a contract to construct a one-story post office building of 28,000 sq ft, slab grade with associated paving, fencing, landscaping, and utility services for $1,106,500. The Contractor was not entitled to equitable adjustment under Type I DSC clause for delay and extra work caused by interaction of abnormal, unseasonal rain with the impervious soil since the impervious nature of soil had been disclosed to contractor. Acts of God, such as severe weather must interact with a Type I (indicated) or Type II (unknown, or unusual) subsurface condition before contractor can recover under the DSC clause. However, the Contractor was awarded an equitable adjustment under the Changes Clause when the Government directed the Contractor to aerate and replace the soil though an constructive (implied) change order.

DSC claimed:

The Type I DSC claim was based on unusually heavy rainfall, a layer of clay overlaying the hardpan (a highly compressed layer of clayey soil), and pockets of free water in the hardpan adjacent the building areas, not disclosed in the logs of borings (severe weather by itself, is an Act of God and not recoverable under the DSC clause). The thin layer of clay had not been disclosed because it was at a depth to which excavation would not have extended but for the supersaturation of the soil caused by severe weather. The borings report, available at the Contractor's request, documented borings taken during a year when the average rainfall was slightly lower (dryer) than usual. A day after the Contractor was given notice to proceed, rainfall average sharply increased. Contractor had tried on three occasion to start earthwork, but each time the equipment got stuck.

Contract Provisions:

The contract noted that borings could be obtained from the San Francisco office and that:

> Contractor shall refer to this report which described the site appearance the soil condition as disclosed by the boring as follows:
>
> Site Appearance:
>
> ...Standing water was observed in the shallow depression through out the site.
>
> Soil Conditions:
>
> ...Beneath the surface soils are cemented sandy silt and silty sand hardpan soils present to a minimum depth of 5-1/2 ft. Interbeded silty sand, sandy silty clays-clayey silts and clayey silts exists below the cemented materials. Groundwater table not encountered within the 14 ft maximum depth of exploration and should not be a factor in design or construction. Cemented hardpan material present at the site are relatively impervious and it is COMMON FOR SURFACE RUNOFF WATER FROM WINTER runs to become perched on these soils, causing standing water observed during field exploration. This

should be taken into consideration in the scheduling of grading operation since a period of many weeks up to a month or more of dry, sunny weather is necessary to properly dry the surface soils to a moisture condition which would allow compaction to be achieved.

The contract also included a standard site condition clause asking contractor to make his own test and assume risk of his interpretations of the conditions and a standard default clause stating the Government was not responsible for Acts of God.

Site Inspections:

The Contractor did not conduct a prudent site inspection. Both contractor and subcontractor responsible for earthwork were familiar with the area. Both knew or should have known that hardpan is a cemented material, relatively impervious to water. Neither examined the engineering report brought to their attention by the bid documents.

Notice:

The Contractor notified CO, by letter, of the DSC claim. The Contractor wrote to the CO suggesting that the sandy silt material be excavated and select fill material be imported or that they wait an indefinite period for natural drying to occur.

Government Action:

A contract modification had been issued as a result of extra work necessary to compact the unusually wet soil. The contract had specified only that the area be scarified to a depth of 6 in. prior to compaction, not that the moisture content be reduced for purposes of compaction.

The CO notified the Contractor that the delay caused by severe weather was an excusable delay. The Contractor was not directed to accelerate the work since the delay was excusable.

The Contractor disagreed and asserted that the wet soil condition constituted a DSC and that he was entitled to a claim for delay costs, including overhead and wage escalation. Later, the Government directed the Contractor to dry out the soil in a manner not contemplated by the contract, i.e., by excavating the material, aerating it, and replacing it. The Contractor felt that this direction constituted an acceleration order or other constructive change to the contract for which it is entitled to equitable adjustment.

Cause of DSC:

The Court found that clay overlying hardpan did not contribute to the retention of moisture in the soil, therefore there was no interaction with weather (Act of God) and an indicated or unknown or unusual condition.

Rationale for Denying DSC Claim:

(1) Acts of God:

The general rule is that Acts of God, such as severe weather must interact with a misrepresented subsurface condition (Type I) or an unknown or unusual physical condition at the site (Type II) to fall under the DSC clause.

(2) Contract interpretation:

The Contractor's expert witness testified that the hardpan (aquiclude) was the primary cause of the wet soil problem. The contract clearly disclosed to the Contractor that it is common for hardpan to have surface runoff water from winter rains become perched on these soils, causing serious drying problem. Also since the Contractor was familiar with the Sacramento area, he knew or should have known of the impervious characteristic of the hardpan and soil drying problems.

The Board held that the evidence did not indicate that the imperviousness of the clay contributed anything more than that of the hardpan to the retention of moisture in the overlying soil. Neither the clay alone or in conjunction with the rainfall and hardpan constituted a DSC. The Board further stated that the moisture of the clay with the overlying soil made the aeration and drying process more difficult but that the problem was discussed under the change order.

Citation: *Welch Construction Co., Inc. v. PSBCA.*, 217 (1977)

American Case

Summary:

(Note: This is a case that deals with notice and waiver of notice, not a DSC case.) The Contractor entered into a cost-plus-fixed-fee contract to produce several electronic countermeasure text simulators. After eight months, the Contractor experienced a cost growth partly due to technical engineering difficulties and to a subcontractor's poor performance. The Contractor successfully appealed the Arms Service Board of Contract Appeals (ASBCA) decision: the Court found that although the Board was correct in finding that the Contractor failed to give timely notice of the cost overruns, the Government was stopped from asserting the 60-day notice requirement in the Limitation of Funds (LOF) clause since the four-pronged test was met. Namely, (1) the Government was aware, (2) the Government induced the Contractor to continue the work, (3) the Contractor was reasonable to rely on inducement, and (4) the Contractor relied on Government to the Contractor's detriment.

Contract Provisions:

The contract's LOF Clause provided:

(1) The CO must be informed in writing of any anticipated cost overruns to incur within 60 days that would exceed 75 percent of the funds alloted for the contract.

(2) Without Government-approved increased cost, Contractor must incur all costs.

(3) Without Government-approved increased allotment, the Contractor is not obligated to continue work.

Notice:

Contractor informed the Government of anticipated cost overruns and sent the Government an estimate 1 month past expiration of notice period.

Government Action:

After the Government received the anticipated cost overrun notice from the Contractor, the Government increased the contract by $900,000, which was $500,000 less than Contractor requested. On several occasions the Government and the Contractor met, and the Government told the Contractor that it was exceeding its funding, but that it was in the Governments best interest to continue work, and the additional $500,000 would be requested. Three months later, the Contractor informed the Government that it would cease work unless $500,000 was added in 30 days. The Government informed the Contractor that funds might not be available for 2 months. The Contractor ceased work after 30 days. By this time 7 months had passed with no funds for the overrun. One month later, the Government informed the Contractor that funding was received, and Contractor asked for residue of $900,000 ($500,000). The Government then informed the Contractor that no funds were available and contractor submitted a claim for $1,361,644. The board argued however that since the Government did not induce the Contractor's continued performance, it is not responsible for the overruns.

Issues Before The Court:

The court considered two issues: (1) Whether the Board correctly found that the Contractor failed to give timely notice, and (2) whether the Board correctly determined that the Government was not stopped from invoking the limited overrun funds clause noted earlier.

Rationale for Awarding Contractor an Equitable Adjustment, Despite the Fact That It Failed to Give Notice:

(1) Awareness:

The Government (technical representative and CO) was aware of the Contractor's overruns and delays. Board agreed with the Court that Government was aware of the problem encountered by the Contractor, so the first part of the test was met.

(2) Inducement:

The Board argued that since the Government informed the Contractor of funding problems from the beginning, the Government did not induce the Contractor to continue performance. The Court, on the other hand, found that the Government's assertion of problems with funding left the Contractor with an expectation that the problems would be resolved. The Government in fact noted that continued performance was in the best interest of the Government and never discouraged the Contractor from performing the work.

(3) Reasonable to rely:

Contractor was not aware of the fact that no implied funding of the overrun was intended, thus it was reasonable for it to rely on the Government conduct which implied that money was forthcoming.

(4) Contractor suffered a detriment:

The Contractor relied on the Government's conduct to its detriment. The Contractor never considered stopping the work until it was informed 7 months later that there was a good possibility that the funds would never be available. The Government should have been aware that the Contractor would continue performance.

Citation: *American Electronics Laboratories, Inc., v. United States* 774 F.2d 1110 (1985)

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